Digital Key Telephone Systems

Installation

Issue	Release Date	Changes	Page
1.0	10-01	Initial Release	
1.1	4-02	Incorporates minor revisions for correctness and clarity	
1.2	3-03	Enhancements allow increased system capacity.	
		ISDN and T1 Clocking material has been revised.	*3-43*
		New line of telephone instruments has been added.	
1.3	11-03	DTIBL Module added	*3-67*
		Adds Type of Service function to VoIP Maint & Troubleshooting section	*4-55*
1.4	3-04	IP Phones added (includes Wallmounts, AC/DC adapter, & RSGM)	*3-76*
		RSGM software upgrade procedure added.	*4-40*
		IP Phone Software Upgrade procedure added.	*4-30*
		Door Box feature added.	*3-86*
1.5	5-04	Additional telephone instruments can be used.	--
1.6	6-04	Incorporates minor revisions for correctness and clarity	--
1.7	9-04	Flash-based Voice Mail Interface Board is added.	*3-61*
2.0	1-05	Ethernet port is functional.	*3-19*
		Table 2-3: System Capacity updated to reflect Feature Package 2 enhancements.	*2-6*
2.1	7-05	VoIP24 Card is added.	*3-40*
2.2	12-05	Hard Drive-based Voice Mail Interface Board has been added.	*3-62*

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mlj/2005

Regulatory Information (U.S.A.)

The Federal Communications Commission (FCC) established rules to allow the direct connection of the *XTS-IP* to a telephone network. Certain actions must be undertaken or understood before the connection of customer provided equipment is completed.

Telephone Company Notification

Before connecting the *XTS-IP* to the telephone network, the local serving telephone company must be given advance notice of intention to use customer provided equipment, and must be provided with the following information:

Telephone Numbers

The telephone numbers to be connected to the system.

XTS-IP System Information

- The Ringer Equivalence Number is also located on the KSU: 1.3B
- The USOC jack required for direct interconnection with the telephone network: RJ11C

FCC Registration Numbers:

- For systems configured as a key system: (button appearances) KF: 5JYKOR-45504-KF-E
- For systems configured as a Hybrid system: (dial access codes) MF: 5JYKOR-45505-MF-E

Incidence of Harm

If the telephone company determines that the customer provided equipment is faulty and possibly causing harm or interruption to the telephone network, it should be disconnected until repairs can be made. If this is not done, the telephone company may temporarily disconnect service.

Changes in Service

The local telephone company may make changes in its communications facilities or procedures. If these changes affect the use of the *XTS-IP* or compatibility with the network, the telephone company must give written notice to the user to allow uninterrupted service.

Maintenance Limitations

Maintenance on the *XTS-IP* System must be performed only by the manufacturer or its authorized agent. The user may not make any changes and/or repairs except as specifically noted in this manual. If unauthorized alterations or repairs are made, any remaining warranty and the software license for the system will be voided.

Hearing Aid Compatibility

All *XTS-IP* Digital Terminals are Hearing Aid Compatible, as defined in Section 68.316 of Part 68 FCC Rules and Regulations.

UL/CSA Safety Compliance

The *XTS-IP* System has met all safety requirements and was found in compliance with the Underwriters Laboratories (UL) 1459. This system is authorized to bear the "NRTL/C" marking.

Notice of Compliance

The *XTS-IP* System complies with rules regarding radiation and radio frequency emissions by Class A computing devices. In accordance with FCC Standard 15 (Subpart J), the following information is supplied to the end user:

"This equipment generates and uses RF energy and if not installed and used in accordance with the Instruction Manual, may cause interference to Radio Communications. It has been tested and found to comply with the limits for a Class A computing device, pursuant to Subpart J of Part 15 of the FCC Rules, which are designed to provide reasonable protection against such interference, when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference."

"**WARNING**: Handling the cord on this product will expose you to lead, a chemical known to the State of California to cause [cancer, and] birth defects or other reproductive harm. ***Wash hands after handling.***"

Toll Fraud and DISA Disclaimer

"While this device is designed to be reasonably secure against intrusions from fraudulent callers, it is by no means invulnerable to fraud. Therefore, no express or implied warranty is made against such fraud including interconnection to the long distance network."

"While this device is designed to be reasonably secure against invasion of privacy, it is by no means invulnerable to such invasions. Therefore, no express or implied warranty is made against unlawful or unauthorized utilization which results in the invasion of one's right of privacy."

Vodavi has made every reasonable effort to ensure that this product works in most business environments. However, there may be some environments (RFI and EFI) in which this product may not work properly. In such cases, it is the responsibility of the installer to take the necessary actions to correct the situation.

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1 Introduction

This manual provides the information necessary to operate and maintain the *XTS-IP* System. The described features are based on the current software release. If any of these features do not work on your system, call your sales representative.

This chapter describes and illustrates the components that may be used with the *XTS-IP* System.

Product Description

Introduction

The *XTS-IP* Digital Key Telephone System is a hybrid Key Telephone System, designed to meet the telecommunication needs of medium or large sized business offices.

The *XTS-IP* System incorporates state of the art digital technology for command processing and voice switching, utilizing a Pulse Code Modulation/Time Division Multiplexing (PCM/TDM, "A" law or "U" law) distributed switching matrix.

The *XTS-IP* achieves a high level of flexibility by:

- Employing a Universal Card Slot architecture in up to three Cabinets that house plug-in Printed Circuit Boards.
- Providing support for different types of instrumentation.

System Design

The Key Service Unit (KSU) of the *XTS-IP* is a wall-mounted cabinet that houses the MB (Mother Board) and card slots for the CO line/Key Station/SLT/ISDN/VoIP interface boards, and other useful boards.

In this system, the first unit is Cabinet 0. Second and third units (Cabinet 1 and Cabinet 2)can be added above Cabinet 0 to increase capacity. A second set of up to three additional Cabinets (Cabinets 3, 4, and 5) can be mounted next to the first set of Cabinets. The MPB should be installed in the fixed MPB slot in Cabinet 0. To add Cabinets above Cabinet 0, the LMU1 should be installed in the fixed LMU slot in Cabinet 0. LMU2 can be used in the fixed LMU slot of Cabinet 1 or Cabinet 2 and is connected with linked cable. To add a second set of Cabinets, an MPBE must be used in Cabinet 0 and an LMUE must be used in the MPB slot of Cabinet 3. The MPBE and LMUE are connected with a Link Cable. The same LMU1 and LMU2 arrangement is used to connect Cabinets 3, 4, and 5 as is used to connect Cabinets 0, 1, and 2.

The system architecture is designed to allow a high level of software control over the system's hardware. The software incorporates a vast array of features and capabilities including PC Database Administration, Least Cost Routing, ACD, etc.

System Flexibility

The *XTS-IP* system supports numerous digital keysets and analog single line devices. With the keysets, commonly used features are activated by direct button selection.

Many functions may be accessed by dialing specific codes or optionally by assigning these dial codes to Flexible Buttons on the keyset. In addition to key telephones, an optional DSS/BLF Console is available.

With the flexibility of the *XTS-IP* extensive feature content, and the capability to use an array of instruments, the *XTS-IP* can be tailored to meet the short and long term needs of the most demanding customer requirements.

Key Service Unit

The Key Service Unit (KSU) is a metal frame cabinet designed for wall or rack mounting. It contains a backplane with connectors that include a PSU slot, 9 universal slots, an MPB slot, an LMU slot, a RAU slot, and PFTU and RGU connectors. The *XTS-IP* KSU consists of Cabinet 0, and can include optional Cabinets 1, 2, 3, 4, and 5 for added capacity. Cable ties are located on the front edge of the cabinet to allow connecting cables to be stored neatly.

The connecting cables for the stations and CO Lines exit through the outlet in the bottom of KSU and can be connected to the Main Distribution Frame (MDF) or to a user installed termination point.

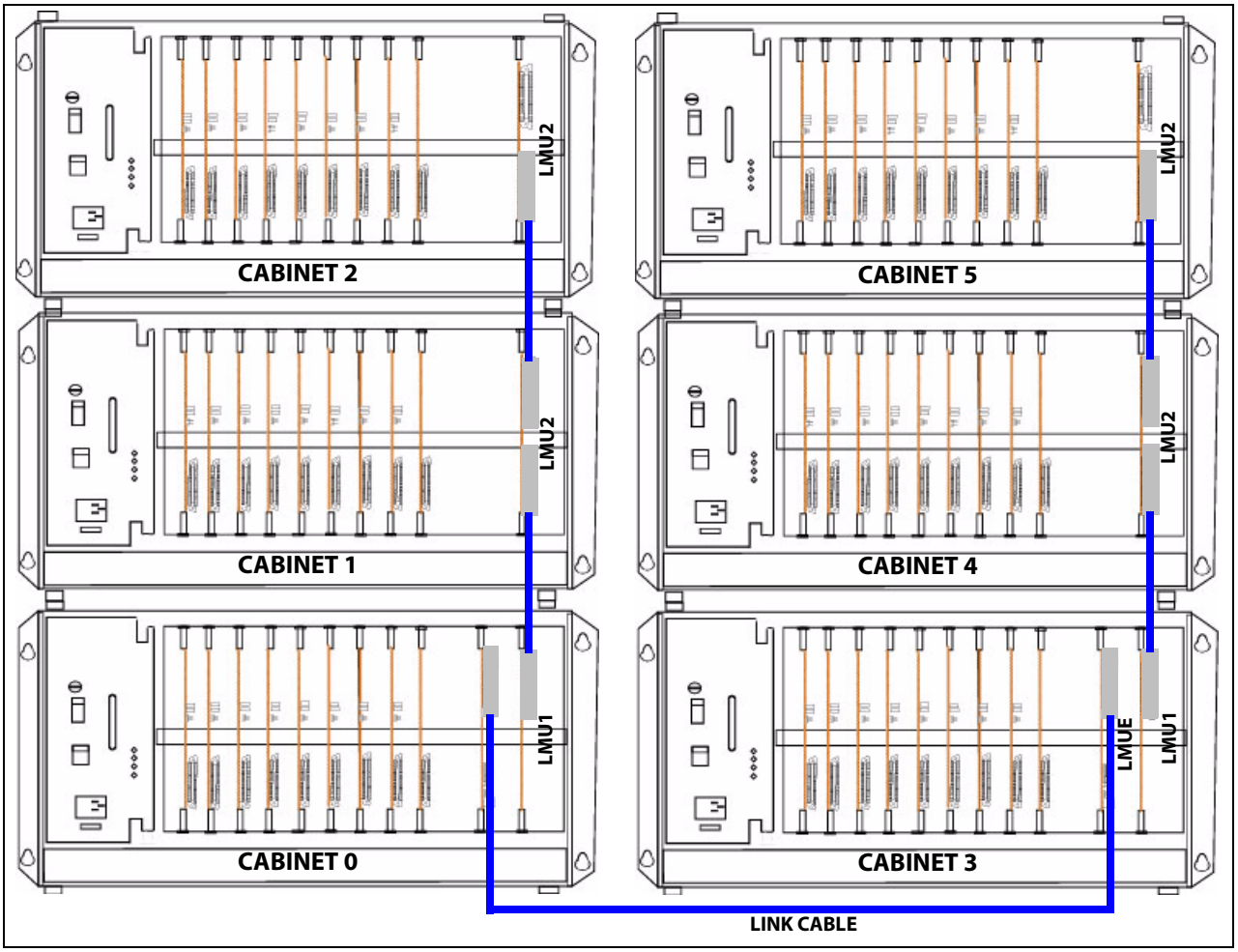


Figure 1-1: KSU Structure

SLOT	0	1	2	3	4	5	6	7	8	9
CARD	DT24	DT24	DT24	SL12	NONE	LCO8	LCO8	LCO8	NONE	MPB

Figure 1-2: XTS-IP Default Card Layout for Cabinet 0

There are nine universal slots in the MB (slots 0-8). Peripheral cards can be installed in the universal slots, but a card that contains a CPU cannot be installed in Slot 8 of Cabinet 0 (T1, PRIB, BRIB, VOIP, LCOBC, SLIBC). There are fixed slots for the PSU, PFTU, MPB, LMU, RGU3, and RAU.

Power Supply Unit

A Power Supply Unit (PSU) is required in each Cabinet of the Key Service Unit. The PSU converts commercial AC power (110 - 127 / 220 - 240V AC @ 50-60 Hz) to DC voltages, regulates the voltages, and provides the appropriate DC voltages to the backplane for distribution to other system components. Three DC outputs are provided: ±5V DC, +30V DC. LEDs in the PSU front panel indicate valid outputs as well as the presence of AC input power.

The PSU includes circuitry to charge externally connected 24-volt batteries and controls operation of the battery back-up circuits. The PSU will provide system operating voltages from the batteries if commercial AC power fails. The battery back-up control circuitry is incorporated in the PSU to disconnect the batteries prior to a deep discharge or over-charge.

Ring Generator Unit

The Ring Generator Unit (RGU3) provides the ring voltage to the SLIB circuits to ring the SLT. The RGU3 also provides the input to the Message Wait source on the SLIB cards. The output of the RGU3 is 65V AC, 25 Hz. The RGU3 can support simultaneous ringing for 15 SLTs.

The RGU3 is fitted on the lower right side panel inside the Cabinet.

Main Processing Board

The Main Processing Board (MPB) controls and manages communication between peripheral interface, supervises all resources in the system, controls gain adjustment of PCM signal, generates system tone, and manages call processing of the system. The three MPBs available for use with the *XTS-IP* are the MPB1, MPB2, and MPBE. **MPB1** is used for a **single-cabinet** installation **only**.

MPB1

The MPB1 incorporates the system's RAM, master clock, an RS-232C port, and the system's PCM voice processing and main micro-processor. The microprocessor is a 32-bit high speed “RISC” CPU which receives and transmits signaling information from/to other PCBs, controls feature activation, and PCM time-slot interchange.

LD1 is the PLLU Synchronization Indicator. This LED will be lit when the PLLU on the MPB has synchronized with an external clock signal provided to the KSU via a BRI, PRI, or T1 circuit. LD2-LD9 indicate the operation of the *XTS-IP* system. LD10-LD13 are reserved for future use.

The MPB1 has the same features as the MPB2 described below, but does not include the following: Paging Port, MOH Port, Port 5, Ethernet jack, or 4 built-in DTMF receivers.

The Real-Time Clock and the 2 MB of SRAM that is associated with the system database are protected in cases of power loss by a long-life high-energy lithium battery. Onboard ROM contains PCM tone, gain table, etc. needed for digital voice processing.

The 4 MB of flash ROM on the Program Module Unit (PMU) for the MPB1 contains basic system operating software. A Modem Unit (MODU) can be installed on the MPB, for remote programming. The MPB1 can only be installed in the MPB slot in Cabinet 0.

» Add-on Boards: MODU and PMU

MPB2

The MPB2 incorporates the system's RAM, master clock, 1 external MOH port, 1 external paging port, 2 RS-232C ports, and the system's PCM voice processing and main micro-processor. The microprocessor is a 32-bit high speed “RISC” CPU which receives and transmits signaling information from/to other PCBs, controls feature activation, and PCM time-slot interchange. The MPB2 has 4 built-in DTMF receivers.

LD1 is the PLLU Synchronization Indicator. This LED will be lit when the PLLU on the MPB has synchronized with an external clock signal provided to the KSU via a BRI, PRI, or T1 circuit. LD2-LD9 indicate the operation of the *XTS-IP* system. LD10-LD13 are reserved for future use.

The Real-Time Clock and the 4 MB of SRAM that is associated with the system database are protected in cases of power loss by a long-life high-energy lithium battery. Onboard ROM contains PCM tone, gain table, etc. needed for digital voice processing.

The 8 MB of flash ROM on the Program Module Unit (PMU) for the MPB2 contains basic system operating software. A Modem Unit (MODU) can be installed on the MPB, for remote programming. The MPB2 can only be installed in the MPB slot in Cabinet 0.

» Add-on Boards: MODU and PMU

MPBE

The MPBE must be used to expand the system beyond the first set of Cabinets 0, 1, and 2. It must be connected with Link Cable to the LMUE in Cabinet 3.

The MPBE incorporates the system's RAM, master clock, 2 RS-232C ports, and the system's PCM voice processing and main micro-processor. The microprocessor is a 32-bit high speed “RISC” CPU which receives and transmits signaling information from/to other PCBs, controls feature activation, and PCM time-slot interchange. The MPBE has 4 built-in DTMF receivers.

LD1 is the PLLU Synchronization Indicator. This LED will be lit when the PLLU on the MPB has synchronized with an external clock signal provided to the KSU via a BRI, PRI, or T1 circuit. LD2-LD9 indicate the operation of the *XTS-IP* system. LD10-LD13 are reserved for future use.

The Real-Time Clock and the 4 MB of SRAM that is associated with the system database are protected in cases of power loss by a long-life high-energy lithium battery. Onboard ROM contains PCM tone, gain table, etc. needed for digital voice processing.

The 8 MB of flash ROM on the Program Module Unit (PMU) for the MPB2 contains basic system operating software. A Modem Unit (MODU) can be installed on the MPB, for remote programming. The MPBE can only be installed in the MPB slot in Cabinet 0.

» Add-on Boards: MODU and PMU

Miscellaneous Board

The Miscellaneous Board (MISB) incorporates the circuitry and interfaces for common optional features including:

External Paging	2 ports
External Control Contacts	4 contacts
External BGM & MOH	2 ports
Alarm	1 input
RS-232C (optional SIU)	2 ports

An RJ21-type female connector is mounted on the front edge of the MISB for the connection to the above circuits, except RS-232C serial interfaces. One MISB board can be installed in Slot 8 of Cabinet 0.

» Add-on Board: SIU

Link Module Unit

The Link Module Unit (LMU) provides a link between the Cabinets of the KSU.

LMU1

The LMU1 must be installed to connect Cabinet 0 to Cabinet 1 and to connect Cabinet 3 to Cabinet 4. Signals are transmitted or received via linked cable as shown in *Figure 1-1: KSU Structure*.

LMU2

The LMU2 is used to connect Cabinets 1 and 2 and Cabinets 4 and 5. Signals are transmitted or received via linked cable as shown in *Figure 1-1: KSU Structure*.

LMUE

The LMUE is used to connect the first set of Cabinets 0, 1, and 2 with the second set of Cabinets; it must be installed in Cabinet 3 (in the slot marked for MPB) and is connected with Link Cable to the MPBE in Cabinet 0. Signals are transmitted or received via linked cable as shown in *Figure 1-1: KSU Structure*. The LMUE contains one external page port and one external background music port.

Extension Boards

Several types of extension boards are capable of supporting various types of telephones as follows:

Table 1-1: Extension Boards

Board Name	Function
DTIB12	Provides 12 Digital Telephone interfaces
DTIB24	Provides 24 Digital Telephone interfaces
ETIB	Provides 12 Analog Telephone interfaces
SLIBC	Provides 12 Single Line Telephone interfaces with Caller ID
SLIBE	Provides 12 Single Line Telephone interfaces

Digital Telephone Interface Board

The Digital Telephone Interface Board (DTIB) provides 2-wire interfaces for telephone connection. Two versions are available (DTIB12 and DTIB24).

The DTIB provides digital voice and data communications to/from digital telephones.

An industry-standard amphenol-type female connector is mounted on the front edge of the PCB for connection to the station interfaces. In addition, one LED is mounted on the PCB to indicate the in use state of the connected telephones. It will turn on when one or more ports are busy.

» Add-on Boards: None

Electronic Telephone Interface Board

The Electronic Telephone Interface Board (ETIB) provides 2-wire interfaces for telephone connection.

An industry-standard amphenol-type female connector is mounted on the front of the ETIB for connection to the station interfaces.

» Add-on Boards: None

Single Line Telephone Interface Board

The Single Line Telephone Interface Board (SLIB) provides 2-wire interfaces for telephone connection. Two versions are available (SLIBE and SLIBC).

An industry-standard amphenol-type female connector is mounted on the front of the SLIBE and SLIBC for connection to the station interfaces.

» Add-on Boards: DTRU4 and MSGU48 on SLIBE, and MSGU48 on SLIBC.

CO Interface Boards

The types of CO Interface boards are listed in the table and narrative that follow.

Table 1-2: CO Interface Boards

Board Name	Function
DIDB	Provides 4 Direct Inward Dial Lines
LCOBC	Provides 8 Loop Start CO Lines (Caller ID capable)
VOIP	Provides up to 8 VOIP interfaces over LAN
VOIP24	Provides up to 24 VOIP interfaces over LAN
T1IB	Provides 24 channels
PRIB	Provides 23 bearer channels and 1 data channel
BRIB	Provides 2 bearer channels and 1 data channel

Direct Inward Dial Board

The Direct Inward Dial Board (DIDB) provides four analog DID CO interface ports. The DIDB can be optionally equipped with a DTMF Receiver Unit (DTRU) to detect DTMF tones. If a DIDB is used, a DTRU is required; it does not necessarily have to be mounted on the DIDB, but it must be installed within the system.

» Add-on Boards: DTRU

Loop Start CO Line Interface Board

The Loop Start CO Line Interface Board (LCOBC) provides Loop Start CO Lines which support pulse/DTMF signal. Each interface contains ring and loop current detection circuits, Analog-to-Digital and Digital-to-Analog conversions, and pulse and ground flash signaling circuits. The LCOBC contains LEDs to indicate the in use status of each CO Line.

The LCOBC is Caller ID capable and has an RJ21-type male connector.

The LCOBC can be equipped with a DTMF receiver unit (DTRU4) to detect DTMF tones.

» Add-on Boards: DTRU4 and CIDU

Voice Over the Internet Protocol Cards

The Voice Over the Internet Protocol (VoIP) card provides up to eight lines per card (two lines per installed VOIP module). The VoIP24 card provides up to 24 line per card when a daughterbaord is used. The VoIP/VoIP24 card allows bi-directional voice communication to other devices via an IP network such as an internal Local Area Network (LAN), the Internet, or a Wide Area Network (WAN) using the Ethernet Interface. It monitors for disconnect while using minimal bandwidth. It also provides four-digit dialing and other features. The VoIP card uses up to 8 fixed time slots and programming allows the use of up to 16 additional time slots that can be used for either stations or CO lines.

» Add-on Boards: VoIP modules

T1 Interface Board

The T-1 Interface Board (T1IB) provides the T-1 (1.544Mbps, 24-Voice Channel) digital interface circuit, control circuitry, and synchronous clock control circuits. DTMF tone detection units can be installed optionally on the T1IB. The T1IB has 8 LEDs on the front edge of the PCB which indicates errors of T-1 line, in-use status, and synchronous clock enable status.

» Add-on Boards: DTRU4

Primary Rate Interface Board

The Primary Rate Interface Board (PRIB) provides one Primary Rate Interface circuit. Each circuit contains 23 bearer and one data channel (23B+D). When a PRIB card is programmed into the system, the system interprets all B channels as trunks. Thus, one PRIB which contains 23B+D circuits provides 23 line appearances to the system. The PRIB card uses 24 time slots when installed.

The PRIB must usually be used in conjunction with a Channel Service Unit (CSU). Connection is made via a DB15 from the PRIB to the CSU. When networking systems that are less than 50 feet apart, no CSU is required.

The PRIB accepts two DTRU4 boards.

When ordering PRI lines from the telephone company, specify ESF framing and B8ZS line coding. PRI only supports National ISDN 2 (NI-2). No other standards are supported.

» Add-on Boards: DTRU4

Basic Rate Interface Board

The Basic Rate Interface Board (BRIB) interface provides four Basic Rate Interface circuits. Each circuit is comprised of two bearer (64Kbps each) and one data (16Kbps) channels (2B+D). When a BRIB is programmed into the system, the system interprets all B channels as trunks. Thus, one BRIB which contains four 2B+D circuits provides eight line appearances to the system. A maximum of seven BRIBs can be installed into the system (56 B channels).

The BRIB uses the U interface of the BRI standard. Connection to the network is made via RJ45 connectors on the front edge of the board. No CSU is required to connect to the central office. The BRIB card uses eight time slots when installed.

When ordering BRI lines from the telephone company, specify Capability P as the ordering code. National ISDN 1 (NI-1) is supported. No other standards are supported.

» Add-on Boards: DTRU4

Add-On Boards

This section describes add-on boards, which can be installed on various types of boards to support additional functions as shown in the following table.

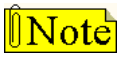
Table 1-3: Add-on Boards

Board	Function	Position
CIDU	Caller ID Unit	LCOBC
DTRU	Two DTMF receiver circuits	DIDB
DTRU4	Four DTMF receiver circuits	LCOBC, SLIBE, T1IB, PRIB, & BRIB
MSGU48	Provides message waiting light indication on SLTs	SLIBE & SLIBC
PMU	Provides operating software	MPB
MODU	Provides a 19.2K baud modem for local access	MPB
RAU	Provides three relay contacts and two alarm functions (not used)	RAU
SIU	Provides additional two RS232 serial interfaces.	MISB

Dual Tone Receiver Unit

The dual tone receiver unit (DTRU) provides Dual Tone Multi frequency (DTMF) circuits. The two versions of the DTRU are: the DTRU and the DTRU4.

- The DTRU can be installed on the DIDB to provide 2 DTMF circuits.
- The DTRU4 can be installed on the LCOBC, SLIBE, T1IB, or PRIB to provide 4 DTMF circuits.



The resources above are shared across the entire system.

Message Waiting Unit

The message waiting unit (MSGU) provides a message waiting light indication on single line telephones.

One or two MSGU48s can be installed on each SLIBE or SLIBC (required if message wait indication is needed).

Program Module Unit

The CPU operates on code in the flash ROMs in the Program Module Unit (PMU) which contains the system control, administration, and call processing. The PMU has 8 MB of ROM (4 MB in PMU for MPB1).

» The PMU must be installed on the MPB.

Modem Unit

The Modem Unit (MODU) (Modulator & Demodulator Unit) provides a communication method interface for remote maintenance and remote PC Admin. It operates in full-duplex, asynchronous modes at line rates up to 19.2 Kbps.

The Modem Unit provides an asynchronous modem for access to the system database and fault reporting features from a remote site. The modem may be connected to a pre-selected CO Line through the system-switching matrix. The MODU port is independent of the SIU standard RS-232C port, allowing system database access, etc., without the need to interrupt the SMDR output.

» The optional MODU is installed on the MPB.

Relay Alarm Unit

The Relay Alarm Unit (RAU) provides three relay contacts and two alarm functions.

Serial Interface Unit

The Serial Interface Unit (SIU) provides an additional two RS-232C (ports 3 & 4) interface circuits on the MISB. The SIU is useful for SMDR print out and Caller ID. The following is a list of the system's output:

On-line SMDR

Statistical information

Caller ID input

ACD

» The optional SIU can be installed on the MISB.

2 System Specifications

This chapter describes the hardware used by the *XTS-IP* system and lists the specifications for each component.

System Capacities

The following tables and charts describe system capacities and display the configuration flexibility of the system.

The KSU contains a PSU slot, nine universal slots, one MPB slot, one LMU slot, one RAU slot, and PFTU and RGU connectors.

Table 2-1: System Capacity

Description		Univ Slots	Usable Capacity MPBE	MPB2	MPB1
Time Slots*	Cabinet 0	9	136 Time Slots	136 Time Slots	136 Time Slots
	Cabinet 1	9	96-144 Time Slots**	96-144 Time Slots**	N/A
	Cabinet 2	9	96-144 Time Slots**	96-144 Time Slots**	N/A
	Cabinet 3	9	144 Time Slots	N/A	N/A
	Cabinet 4	9	96-144 Time Slots**	N/A	N/A
	Cabinet 5	9	96-144 Time Slots**	N/A	N/A
KSU Cabinets			6 Cabinets	3 Cabinets	1 Cabinet
Serial Ports (RS-232C)			4 Ports (MPB: 2, MISB: 2)	4 Ports (MPB: 2, MISB: 2)	3 Ports (MPB:1, MISB:2)
Alarm			3 Inputs (RAU: 2, MISB: 1)	3 Inputs (RAU: 2, MISB: 1)	3 Inputs (RAU: 2, MISB: 1)
External Control Contacts			7 Contacts (RAU: 3, MISB: 4)	7 Contacts (RAU: 3, MISB: 4)	7 Contacts (RAU: 3, MISB: 4)
Music Source Inputs			3 Inputs (LMUE: 1, MISB: 2)	3 Inputs (MPB: 1, MISB: 2)	2 Inputs (MPB: 0, MISB: 2)
DTMF Receivers			24 Receivers (MPB: 4, SLT/CO cards: 20)	24 Receivers (MPB: 4, SLT/CO cards: 20)	24 Receivers (MPB: 0, SLT/CO cards: 24)
Power Fail Circuits			30 Circuits	30 Circuits	30 Circuits
Paging Zones	External		3 Zones (LMUE: 1, MISB: 2)	3 Zones (MPB: 1, MISB: 2)	2 Zones (MPB: 0, MISB: 2)
	Internal		8 Zones	8 Zones	8 Zones
DSS/BLF Consoles			3 Consoles (per station)	3 Consoles (per station)	3 Consoles (per station)
Ethernet Connection			1	1	N/A

** Time slots are used to support each CO Line and each station. A Cabinet cannot support more than 96 stations.*

*** Maximum time slots on Cabinets 1 and 2 or in Cabinets 4 and 5 can range from 96 to 144 each, but the total time slots between each two Cabinets cannot exceed 240.*

**** MPB1 - Maximum COs are 48 and maximum stations are 96*

MPB2 - Maximum COs are 144 and maximum stations are 252

MPBE - If maximum of 216 COs are used, then maximum stations are 384. If maximum stations of 492 are used (400 digital station max, remaining 92 are SLT), then maximum COs are 108. Total usable time slots in the system is 600.

System Components

This table shows the slot positions and applicable Cabinets for each card that can be installed in the *XTS-IP* System.

Table 2-2: System Card Description

Item	Number of Time Slots	Slot Position	Cabinets	Description
BRIB	8	1-7 or 0-7	0, 1, & 2	Basic Rate Interface Board
CIDU	--	LCOBC		Caller ID Unit
DIDB	4	1-8 or 0-8	All	Direct Inward Dial Board
DTIB12	12	0-8	All	Digital Telephone Interface Board
DTIB24	24	0-8	All	Digital Telephone Interface Board
DTMFA	---	LCOBC, SLIBE, T1IB, PRIB, BRIB		DTMF Receiver Unit (4 port)
DTRU	---	DIDB		DTMF Receiver Unit (2 port)
DTRU4	---	LCOBC, SLIBE, T1IB, PRIB, BRIB		DTMF Receiver Unit (4 port)
ETIB	12	1-8 or 0-8	All	Electronic Telephone Interface Board
KSU	---	---		Key Service Unit
LCOBC	8	1-7 or 0-7	0, 1, 2, & 3	Loop Start CO Interface Board (Caller ID capable)
LMU1	---	LMU	0 & 3	Link Module Unit
LMU2	---	LMU	1, 2, 4, & 5	Link Module Unit
LMUE	---	LMU	3	Link Module Unit
MISB	---	8 only	0	Miscellaneous Board
MODU	---	MPB		19.2 Kbps Internal Modem
MPB1	---	MPB		Main Processing Board = 136 Time Slots Usable
MPB2	---	MPB		Main Processing Board = 376 Time Slots Usable
MPBE	---	MPB		Main Processing Board = 600 Time Slots Usable
MSGU48	---	SLIBE, SLIBC		Message Waiting Unit

The first range of slot positions, for entries that show two ranges, applies to Cabinets 0. The second range of slot positions applies to slots in other cabinets where the card can be used.

EXAMPLE -- The BRIB card can be used in slot 1-7 of Cabinet 0 and in slots 0-7 in Cabinets 1 & 2.

Table 2-2: System Card Description

Item	Number of Time Slots	Slot Position	Cabinets	Description
PFTU	---	---		Power Failure Transfer Unit
PMU	---	MPB1		Program Module Unit, 4 MB ROM
PMU	---	MPB2/MPBE		Program Module Unit, 8 MB ROM
PRIB	up to 24	1-7 or 0-7	0, 1, & 2	Primary Rate Interface Board
PSU	---	PSU		Power Supply Unit, 350W
RAU	---	RAU	0	Relay Alarm Unit
RGU3	---	---		Ring Generator Unit (25Hz): Sine Wave, Internal
SIU	---	MISB		Serial Interface Unit
SLIBC	12	1-7 or 0-7	0, 1, 2, & 3	Single Line Interface Board w/ Caller ID
SLIBE	12	1-8 or 0-8	All	Single Line Interface Board
T1IB	up to 24	1-7 or 0-7	0, 1, & 2	T1 Interface Board
VMIB	8	1-7 or 0-7	0, 1, 2, & 3	Voice Mail Interface Board - Flash-based
VMIB	12	1-7 or 0-7	0, 1, 2, & 3	Voice Mail Interface Board - Hard Drive-based
VOIP	up to 8	1-7 or 0-7	0, 1, 2, & 3	VoIP Card w/one VoIP Module
VOIP	up to 8	1-7 or 0-7	0, 1, 2, & 3	VoIP Card w/two VoIP Modules
VOIP	up to 8	1-7 or 0-7	0, 1, 2, & 3	VoIP Card w/three VoIP Modules
VOIP	up to 8	1-7 or 0-7	0, 1, 2, & 3	VoIP Card w/four VoIP Modules
Module	--	VOIP		VoIP module (only for upgrade)
VOIP24	up to 24	1-7 or 0-7	0, 1, 2, & 3	VoIP24 Base Card (12 port)
Module	--	VOIP24		Daughterboard for VoIP24 Card

The first range, for entries that show two ranges of slot positions, applies to Cabinet 0. The second range of slot positions applies to slots in other cabinets where the card can be used.

EXAMPLE -- The T1IB can be used in slot 1-7 of Cabinet 0 and in slots 0-7 in Cabinets 1 & 2.

System Configuration Tables

Table 2-3: System Capacity

Item	Capacity		
Account Codes Number of digits per account code Number of Account Codes- Unverified Number of Account Codes - Verified	Up to 12 unverified digits Unlimited 500 Account Codes (750 for MPBE systems)		
ACD Groups Groups Members RAN Announcements Calls in Queue	Software supports up to 32 Groups Software supports up to 252 stations in each Group 32 RAN Announcements per system, 3 per ACD Group All CO Lines may be queued for an ACD Group		
Attendants	Up to 6 stations can be designated as Attendants.		
CO Lines CO/PBX/Centrex Lines DID Lines T-1 Trunks ISDN Trunks	**MPB1** 48 maximum	**MPB2** 144 maximum	**MPBE** 216 maximum
Conference Circuits Parties	10 Conferences per system 8 parties per conference, of which 5 can be external		
Dialing Memory Station Speed Dialing System Speed Dialing Total Speed Dial	20 Bins per station (24-digits) 980 Bins per system (24-digits) 3000 Bins per system (24-digits)		
Digital DSS/BLF Units	180 maximum Each DSS/BLF unit requires 1 station port and reduces station capacity by 1. DSS/BLF maps may not be duplicated at one station. 1 station may have up to 3 DSS/BLF units associated with it.		
DISA Circuits	Unlimited number of CO lines may be programmed simultaneously.		
Hunt Groups Groups Members Types	Software supports up to 8 Groups Software supports up to 24 stations in each Group Station, Pilot Hunting, or Pilot Ring All		
Loop Supervision Disconnect	700 msec. duration (CO or Internal call to SLT)		
Music Channels Music-On-Hold/Background Music	8 Channels per system (4-8 on CO, ports 1 & 2 on MISB, port 3 on MPB2) (port 3 is unavailable for MPB1)		
Page Zones Internal Paging External Paging	**MPB1** 20 max (software controlled) 2 maximum	**MPB2** 20 max (software controlled) 3 maximum	**MPBE** 20 max (software controlled) 3 maximum

Table 2-3: System Capacity

	MPB1	MPB2	MPBE
Stations Analog Stations Digital Telephones Single Line Telephones	96 maximum	252 maximum (No more than 96 stations are supported per Cabinet.)	400 maximum 400 maximum 480 maximum
UCD Groups Groups Members RAN Announcements Calls In Queue	Software supports up to 8 Groups Software supports up to 8 stations in each Group 32 RAN Announcements per system, 2 per UCD Group All CO Lines may be queued for a UCD Group		
Voice Mail Groups Groups Members (ports) Integration Method Positive Disconnect VM Message Wait VM Disconnect Signal	Software supports up to 8 Groups Software supports up to 24 stations per group In-Band signaling (DTMF) Loop supervision is provided to ensure disconnect Programmable 12-digit (DTMF) string If 0 digits are programmed, 15 sec of silence are followed by a busy tone.		

Table 2-4: Environment Specification

Item	Degrees (°F)	Degrees (°C)
Operation Temperature	32-104	0-40
Optimum Operation Temperature	68-78	20-26
Storage Temperature	32-158	10-70
Relative Humidity	0-80% non-condensing	

Table 2-5: Loop Limits

Item	Capacity
Analog Electronic Telephone*	Maximum length of station loop: 1000 feet of 24 AWG (4 wire, inside wiring, twisted cable)
Digital Telephones*	Maximum length of station loop: 1000 feet of 24 AWG (2-wire, inside wiring, twisted cable)
Single Line Telephones*	2000 feet of 24 AWG
*All stations must be installed in the same building. Station circuitry does not contain protection to support off-premise operation.	

Table 2-6: FCC Registration Numbers

System	FCC Number
For a **Key System** configuration (button appearance)	KF: 5JYKOR-45504-KF-E
For a **Hybrid System** configuration (dial access codes)	MF: 5JYKOR-45505-MF-E

Table 2-7: Electrical Specifications

Item	Specification
Power Supply AC Voltage Input AC Power AC Input Fuse DC Output Voltage	 120 or 220 +/- 10% Volt AC @48-63Hz 350W 5.0 amp @ 220Volt AC + 5V @ 10A, - 5V @ 1.5A, + 30V @ 8.4A
Battery Backup Input Voltage Battery Fuse Charging Current	 24Volt DC 12.5amp @250Volt AC Maximum 1A
External Relay Contact	1 amp @24Volt DC
Longitudinal Balance	60 db from 200 Hz to 1,000 Hz 40 db from 1000 Hz to 4000 Hz
Idle Channel Noise	Less than 15 dbrnco for all connections
Cross Talk Attenuation	Greater than 75 dbm Station to CO and Station to Station
Single Frequency Distortion (300 - 3400 Hz)	Station to CO Line and station to station: Better than 2.0% or 34 db for an Output level -30 dbm to 0 dbm
Ringing Detect Sensitivity	40Vrms @16-30Hz 30Vrms @30-37Hz
Ringer Equivalence Number (REN)	LCOB: 0.8B; DIDB: 0.0B; T1IB: 6.0P
Co Line Signaling - DTMF	Frequency pair at ±5dbm Frequency tolerance ±1.5%
CO Line Signaling - Dial Pulse	10 pps and 20 pps programmable
Input Level Range	+10 db maximum
Music Source Music-On-Hold input Background Music input	 600Ω input at Ødbm maximum from music source 600Ω input at Ødbm maximum from music source
External Page Port Output Impedance Output Power w/o Compression	 600Ω @ 0dbm 5 milliwatt max
CSA File Number	(NRTL/C) LR57228
Telephone Transmitter	Electret mic compatible

Table 2-8: Dialing Specifications

Item	Specification
DTMF Dialing Frequency Deviation Rise Time Duration of DTMF Signal Interdigit Time	 Less than +/-1% Maximum 3ms Minimum 75ms Minimum 75ms
Pulse Dialing Pulse Dialing Rate Pulse Break/Make Duration	 10 or 20 pps 60/40% or 67/33%
CO Type	Loop Start, 600 ohm, current sensing

Table 2-9: Trunk Ordering Info: Public Network/Private Lease Lines

System Port Identification, Facility Interface and Service Order Codes				
Interface Card	**Ringer Equivalent Number (REN)**	**Facility Line Interface**	**Jack Type**	**Ordering Specification**
CO Port (LCOBC)	0.8B	02LS2	RJ21X	
Direct Inward Dial (DIDB)	0.0B	02RV2-T	RJ11	
T-1 Port (T1IB) or ISDN Port (PRIB)	6.0P	04DU9-B	RJ45	
T1 circuit used with PRI networking				B8ZS, non-channelized, point-to-point T1, 1.544 Mbps

Table 2-10: Dimension and Weight

Item	Height		Width		Depth		Weight	
	in	*mm*	*in*	*mm*	*in*	*mm*	*lbs*	*kg*
KSU	16.2	411	24.8	630	9.4	238	25.3	11.5
Digital Keyset	9.3	236	7.6	192	3.3	84	3.3	1.5
Digital DSS/BLF Console	9.3	236	4.9	125	2.4	62	2.0	0.9

Table 2-11: Electronic Telephone Audible Signals

Type of Signal	Frequency	Signal Duration (in seconds unless otherwise indicated)
Electronic Telephone Signals		
Incoming CO Line	440+480	0.4 on/0.4 off/0.4 on/2.0 off; Repeated
Intercom Tone Ringing	440+480	0.8 on/2.4 off; Repeated
Intercom Call Announce (H-P modes)	440	0.2 on/0.2 off; (3 bursts)
Transferred CO Line	440+480	0.8 on/2.4 off; Repeated
CO Line Recall	440+480	0.24 on/0.6 off; Repeated
Message Wait Call Back	440+480	0.8 on/2.4 off; Repeated
CO Queue Call Back	440+480	0.8 on/2.4 off; Repeated
Camp-On	440	0.8 on (1 burst)
Paging Alert Tone	440	1.0 on
Type of Signal	**Frequency**	**Signal Duration** (in seconds unless otherwise indicated)
Electronic Telephone Confidence Tones		
Intercom Ringback	440+480	0.8 on/2.4 off
Transferred CO Line	440+480	0.8 on/2.4 off
Call Announce	440	0.2 on/0.2 off; (3 bursts)
Busy Tone	480+620	1.0 on/0.2 off/1.0 on/0.2 off/0.2 on/ 0.2 off/ 0.2on/0.2 off/0.2 on; Repeated
Error Tone	480+620	0.2 on/0.1 off; Repeated
Intercom Dial Tone	350+440	Steady
DND Tone	350+440	0.4 on/0.4 off/0.2 on/0.2 off/0.2 on; Repeated
Paging Confirmation Tone	350+440	1.0 on
Conference Time-out/Re-Enter Tone	440	Programmable Steady Tone
Confirmation Tone	350+440	0.2 on/0.2 off; (3 bursts) CO/PBX

Table 2-12: Single Line Audible Signals

Type of Signal	Frequency	Signal Duration (in seconds unless otherwise indicated)
Single Line Signals		
Incoming CO Line	20Hz 90 VAC	2.0 on/4.0 off; Repeated
Intercom Tone Ringing	20Hz 90 VAC	1.0 on/0.2 off/1.0 on/4.0 off; Repeated
Transferred CO Line	20Hz 90 VAC	1.0 on/0.2 off/1.0 on/4.0 off; Repeated
CO Line Recall	20Hz 90 VAC	2.0 on/4.0 off; Repeated
CO Queue Call Back	20Hz 90 VAC	1.0 on/2.0 off; Repeated
Type of Signal	**Frequency**	**Signal Duration** (in seconds unless otherwise indicated)
Single Line Confidence Tones		
Intercom Ringback	440+480	1.0 on/3.0 off
Transferred CO Line	440+480	1.0 on/0.2 off/1.0 on/4.0 off
Call Announce	440	0.2 on/0.2 off; (3 bursts)
Busy Tone	480+620	1.0 on/0.2 off/1.0 on/0.2 off/0.2 on/ 0.2 off/0.2on/ 0.2 off/0.2 on; Repeated
Error Tone	480+620	0.2 on/0.1 off; Repeated
Intercom Dial Tone	350+440	Steady
DND Tone	350+440	0.2 on/0.2 off/0.2 on/0.2 off/0.2 on/0.2 off; burst
Paging Confirmation Tone	350+440	1.0 on
Conference Time-out Tone	440	Programmable Steady Tone
Confirmation Tone	350+440	0.2 on/0.2 off; (3 bursts)

Table 2-13: Digital Station Visual Signals - CO Line Buttons

Feature/Function	Flash Rate	LED Color
Incoming CO Ringing	60 ipm double wink	Red
Transferred CO Ringing	120 ipm Flash	Red
CO Line Recalling	480 ipm Flutter	Red
System HOLD	60 ipm double wink	Red
Exclusive HOLD (I-Hold)	120 ipm Flash	Green
I-HOLD (System)	60 ipm wink	Green
CO Line Queue Call Back	480 ipm Flutter	Red
CO Line in Use	ON Steady	Red
CO Line	Idle	OFF
Exclusive Hold (other stations)	ON Steady	Red

Table 2-14: Digital Station Visual Signals - DSS/BLF Buttons

Feature/Function	Flash Rate	LED Color
Off-Hook (Busy)	ON Steady	Red
Incoming Intercom Ring	120 ipm Flutter	Red
Call Announce (H or P Mode)	Steady	Red
Message Waiting Call Back	120 ipm Flutter	Red
Station in Do Not Disturb	60 ipm Double Flash	Red
Camp On (by station)	120 ipm Flash	Red
Automatic Call Back	120 ipm Flash	Red
Station Unavailable (ACD/UCD)	60 ipm Flash	Red off (3 bursts)+480

Table 2-15: Digital Station Visual Signals - Feature/Function Buttons

Feature/Function	Flash Rate	LED Color
Call Forward (active)	Steady	Red
Message Wait (active)	Steady	Red
Camp On (active)	120 ipm Flash	Red
Call Back (active-initiator)	120 ipm Flash	Red
CO Line Queue (active)	480 Flutter	Red
DND (active)	Steady	Red
Mute	Steady	Red
On/OFF	Steady	Red
Conference	Steady	Red
Speed (moment on until bin address dialed)	Steady	Red
Personalized Messages	15 ipm Flash	Red
Tone Intercom Call (Hold button)	15 ipm Flash	Red
Loop	same as CO	Green/Red
Pool	same as CO	Green/Red
Transfer	60 ipm Flash	Green

Table 2-16: Signals to Called Station (Digital Station)

Feature (Indication)	Sound in Hz	Occurrence - Cadence (in seconds unless otherwise indicated)
Incoming CO Line	(*user selectable)	0.4 on/0.4 off/0.4 on/2.0 off
Intercom Tone Ringing	(*user selectable)	0.8 on/2.4 off; Repeated
Intercom Call Announce (H & P)	935	0.2 on/0.2 off; (2 bursts)
Transferred CO Line	(*user selectable)	0.2 on/0.2 off; (2 bursts)
CO Line Recall	(*user selectable)	0.2 on/0.6 off; Repeated
Message Waiting Call Back	(*user selectable)	0.8 on/2.4 off; Repeated
Queued CO Line Call Back	(*user selectable)	0.2 on/0.6 off; Repeated
Camp On	935	0.8 second burst
Alarm Tone - Repeated	701/857	1.0 on/.25 off; Repeated
Alarm Tone - Single (Continuous)	701/857	1.0 on; (once every 30-60 seconds until alarm is reset)
* Only one (1) tone can be selected by a station at a time. This tone is used for all signaling that uses the "User Selectable" tone.		

Table 2-17: Signals to Calling Station (Digital Station)

Feature (Indication)	Sound in Hz Station	Occurrence - Cadence (in seconds unless otherwise indicated)
Intercom Ring Back Tone	1215/1471	1.0 on/2.8 off; Repeated
Intercom Call Announce	935	0.2 on/.24 off; three (3) times (HF mode)
Busy Tone	701	1.0 on/0.2 off/ 1.0 on/0.2 off/0.6 on/0.6 off/0.2 on/0.2off/ 0.2 on/0.2 off/0.2 on/0.2 off
Error Tone	701	0.2 on/0.1 off; Repeated
Intercom Dial Tone	420	Continuous
DND Tone	701	0.26 on/0.2 sec off/0.2 on/0.2 off/0.2 on/0.6 off; Repeated
Paging Confirmation Tone	935	1 second burst
Conference Time Out Warning Tone	420	1 second burst
Programming Confirmation Tone	440	three 100ms bursts
Programmed Error Tone	1471	0.2 on/0.2 off; Six (6) times

Table 2-18: Voice Mail Confidence Tones

VM Condition Action	Tone Received	Sound In Hz	Occurrence - Cadence (in seconds unless otherwise indicated)
Off Hook	Internal Dial Tone (no stutter tone)	350/440	Continuous
Calls an Internal Station (idle)	Ring Back Tone	440/480	0.8 on/2.4 off; Repeated
Initiate a Transfer (hook-flash)	Internal Dial Tone (no stutter tone)	350/440	Continuous
Calls an Internal Station (busy) *Call back not allowed	Busy Tone	480/620	1.0 on/0.2 off/1.0 on/0.2 off/0.2 on/ 0.2 off/0.2 on/0.2 off/0.2 on
Calls an Internal Station (DND)	Busy Tone	480/620	1.0 on/0.2 off/1.0 on/0.2 off/0.2 on/ 0.2 off/0.2 on/0.2 off/0.2 on
Calls an Internal Station (programmed/not equipped)	Busy Tone	480/620	1.0 on/0.2 off/1.0 on/0.2 off/0.2 on/ 0.2 off/0.2 on/0.2 off/0.2 on
Calls an Internal Station (not programmed/not equipped)	Error Tone	480/620	0.2 on/0.1 off; Repeated
Dials an Invalid Digit/FACODE/Station	Error Tone	480/620	0.2 on/0.1 off; Repeated
Calling Party Disconnects (Internal or External call)	Silence or (Disconnect Digits)	0 or (DTMF Digits)	(Continuous or as programmed)

VoIP24 Station Port Capacity

- A maximum of 48 IP stations can be accommodated on the MPB1 system.
- A maximum of 96 IP stations can be accommodated on the MPB2/MPBE systems.
- Cabinets 0, 1, and 2 can be used in MPB2/MPBE systems. Cabinet 3 can also be used in MPBE systems.
- A maximum of 3 VoIP24 cards can be installed per cabinet.
- A maximum of 3 VoIP24 cards can be installed per MPB1 system.
- A maximum of 9 VoIP24 cards can be installed per MPB2/MPBE system.
- The VoIP24 base card (12 ports) can accommodate 24 IP stations in a blocking arrangement.
- The VoIP24 card with Daughterboard can accommodate 24 IP stations (non-blocking). Cannot accommodate a 2 to 1 ratio.

Blocking = A user goes off-hook and may not receive dialtone if no IP resources are available (busy).

Non-blocking = A user has a dedicated IP channel at all times. No busy condition.

Blocking	MPB1		MPB2		MPBE	
	Cards	Stations	Cards	Stations	Cards	Stations
VoIP24 base card	2	48	4	96	4	96
VoIP24 w/daughterboard*	--	--	--	--	--	--

* Blocking is not applicable to VoIP24 w/daughterboard

Non-Blocking	MPB1		MPB2		MPBE	
	Cards	Stations	Cards	Stations	Cards	Stations
VoIP24 base card	2	24	6	72	6	72
VoIP24 w/daughterboard	2	48	4	96	4	96

3 System Installation

This chapter provides the basic system installation and wiring instructions for the *XTS-IP*, as well as how to install the optional cards and interface units.

Introduction

As with any sophisticated communications device, installation of the *XTS-IP* requires the care and forethought of a competent technician. To assure easy servicing and reliable operation, several factors must be considered when planning the system installation. The installation consists of these major steps:

- Site Preparation
- KSU and Power Supply (PS) Installation
- PCB Installation
- System Wiring
- Keyset and Terminal Installation
- System Programming and Verification

Installing the *XTS-IP* is quick and efficient if these installation instructions are followed.

Site Preparation

General Site Considerations

The first step is to locate an acceptable site for the common equipment (KSU, boards, etc.). When locating a mounting site for the KSU, the following points must be considered.

Wall Mounting -- The KSU is designed for wall mounting and should not be mounted directly to a masonry or plasterboard wall. It is recommended that a 1/2 inch plywood back board be firmly mounted to the wall, and the KSU and main distribution frame be mounted to the back board.

Rack Mounting -- The KSU is also designed for rack mounting using the optional floor or cabinet-model rack. If using the rack mounting option, ensure the location for the unit is on a flat flooring area.

Dedicated Access -- The location must have access to a dedicated 120 Volt AC (±10%), 60 Hz, single-phase circuit with a circuit breaker or fuse rated at 15 amps. A 3-wire (parallel blade grounded outlet should be within approximately 6 feet of the lower left rear of the Cabinet 0 mounting.

Grounding -- The location must have access to a good earth ground, such as a metallic cold water pipe with no non-metallic joints. The ground source should be located as close as possible to the system.

Ventilation -- The system should be located in an area which is well ventilated with a recommended temperature range of 68°-78° F and a relative humidity range of 5-60% (non-condensing).

Distance Parameters -- The system should be located within 25 feet of the telephone company's termination point. Also, the location should be within the prescribed station loop lengths for all keysets and terminals. If existing cabling is to be used, the location of existing cabling and conduits should be considered.

Accessibility -- The location should have adequate accessibility, space, and lighting for future servicing and should consider the need for future expansion.

Hazard Protection -- The system should be located in an area that is protected from flooding, flammable materials, excessive dust and vibration.

Interference -- The site should be away from radio transmitting equipment, arc-welding devices, copying machines and other electrical equipment that are capable of generating electrical interferences. Operation of this equipment may cause interference; in this case the user, at their own expense, must take whatever measures may be required to correct the interference.

Backboard Installation

A wooden backboard is recommended for all installations and must be installed when the location has masonry or plasterboard walls.

- A 1/2-inch plywood material is sufficient for most installations.
- The back-board should be mounted at a convenient height, about 3 feet above the floor and bolted in a number of places to distribute the weight of the system.
- Space should be available on the bottom side of the back-board for the MDF cabling and for optional equipment such as a music source and PFTU, etc.
- It is recommended the location of each major item be roughly sketched on the backboard as an installation layout.

Verify On-Site Equipment

Once the equipment installation site has been identified and a dedicated AC outlet, earth ground, lighting, and ventilation are available:

1. Verify that all equipment required is on-site and has not been damaged during shipment.
2. Unpack the KSUs to assure there is no shipping damage.
3. Notice that a mounting template is packed with each KSU and this template is required later in the installation.
4. Check that the type and quantity of boards receive is correct and optional equipment and a Power Line Surge Protector are on-site.
5. It is not necessary to unpack the individual boards at this time.

Note	*If any equipment is damaged or missing, notify the appropriate personnel to correct the situation.*

KSU Installation

The *XTS-IP* Key Service Unit (KSU) consists of Cabinet 0 and optional Cabinets 1, 2, 3, 4, and 5. The basic exterior of the *XTS-IP* System is shown in *Figure 3-1*.

Mounting Cabinet 0

The Cabinet is a metal frame cabinet designed for wall mounting. Use the mounting template provided with the Cabinet to mark the location for the screws to mount the Cabinet. The Cabinet must NOT be mounted directly on a masonry or dry-wall surface; in this case a wooden backboard is required. Refer to *Figure 3-2* for the distance between mounting holes. Use the same procedure for mounting Cabinet 3.

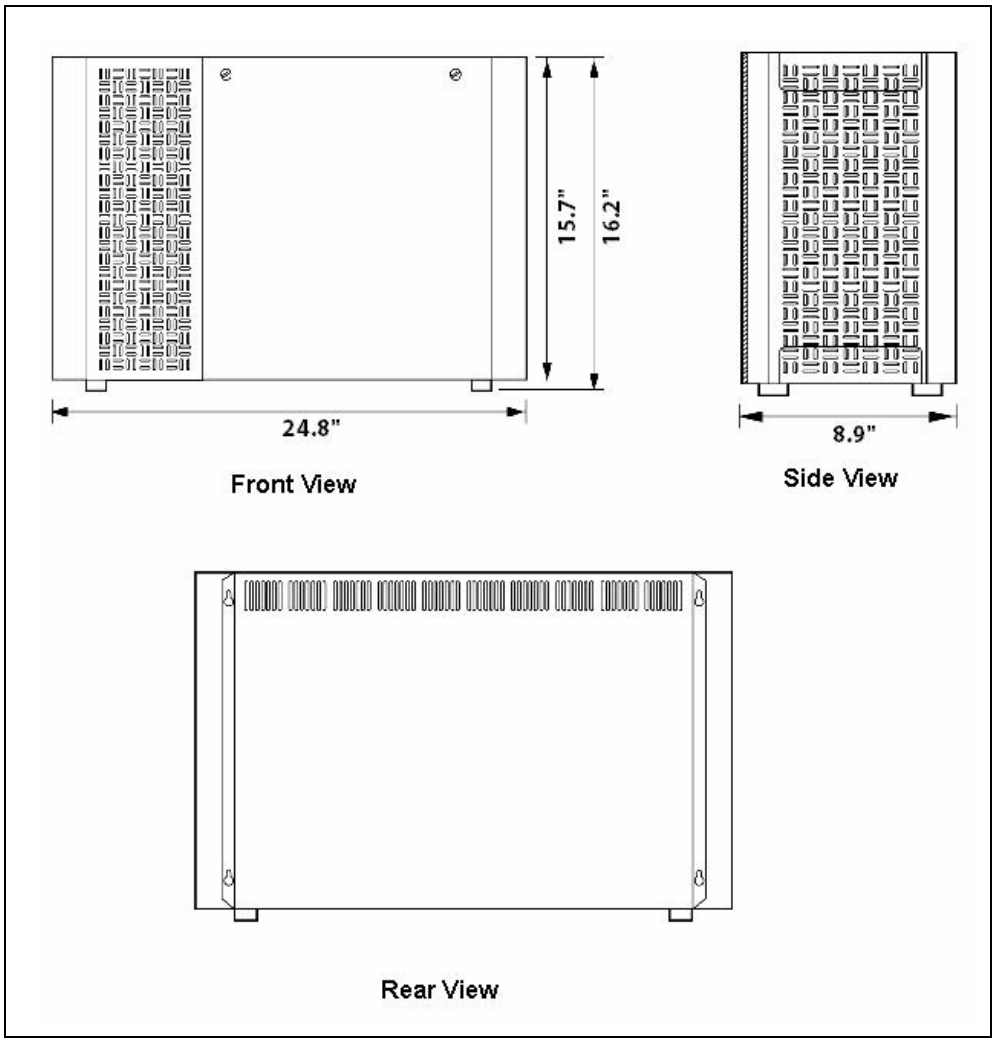


Figure 3-1: *XTS-IP* Mounting Holes and Installation Layout

The Cabinet is mounted with four #10 or larger, 1 ½ inch or longer screws.

1. Drill pilot holes in the locations marked, insert the screws and tighten, leaving about ½ inch exposed.
2. Mount the Cabinet on the screws and tighten the screws securely.

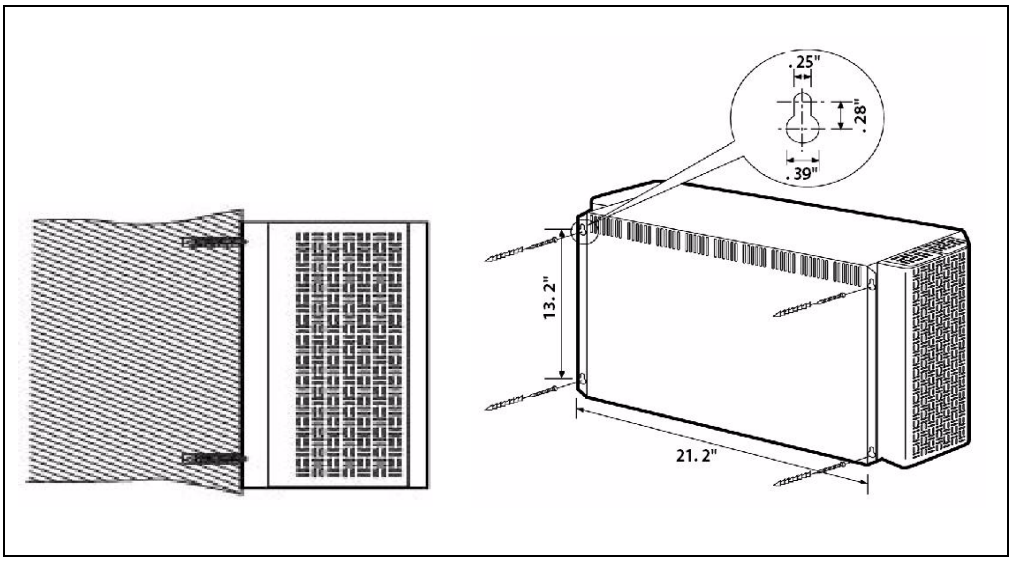


Figure 3-2: Mounting *XTS-IP* Cabinet

Mounting Cabinet 1 and Cabinet 2

The optional Cabinets include a metal housing designed for wall mount installation. Cabinet 1 is mounted above Cabinet 0 and Cabinet 2 is mounted above Cabinet 1. Use the same procedure for mounting Cabinets 4 and Cabinet 5.

1. Before mounting the optional Cabinets, remove the Interconnection Cover on the top right side of Cabinet 0 and Cabinet 1 and on the bottom of Cabinet 1 and Cabinet 2.
2. Mount the optional Cabinet on the screws and tighten the screws securely.
3. Mount the four side brackets between the Cabinets.
4. Interconnection is achieved via a amphenol-type connector. No cable is used to connect the Cabinets together. Refer to *Figure 3-3*.

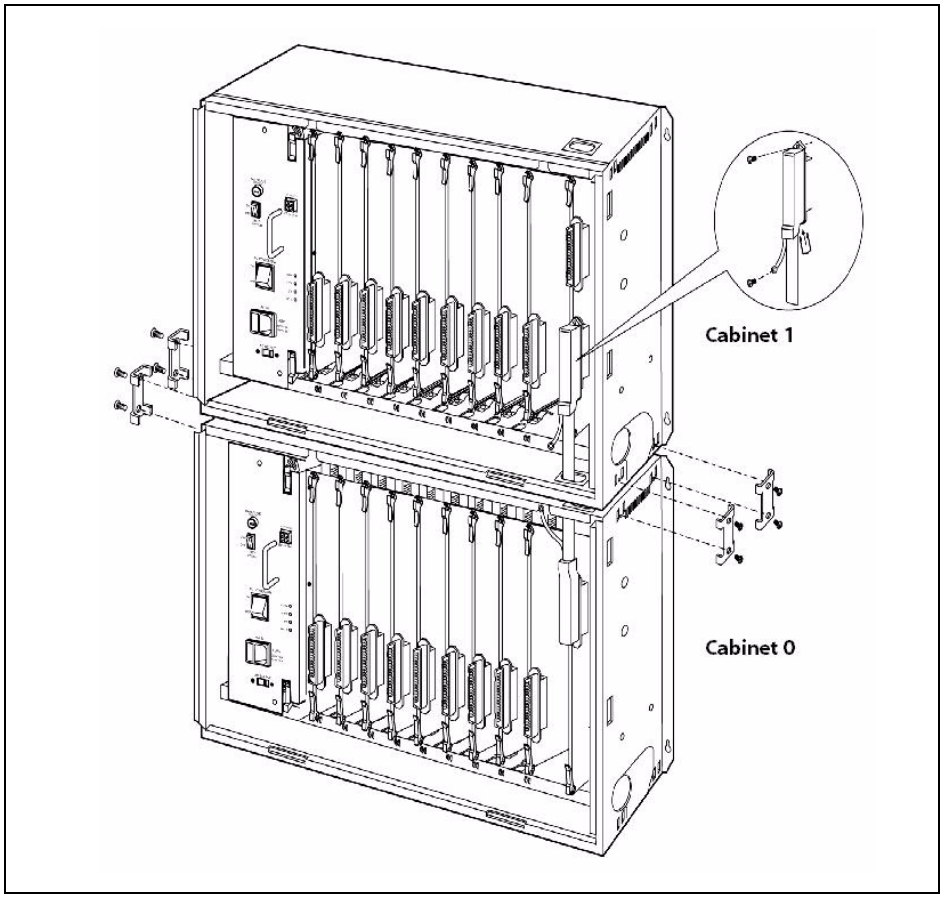


Figure 3-3: Connecting Cabinet 0 and Cabinet 1

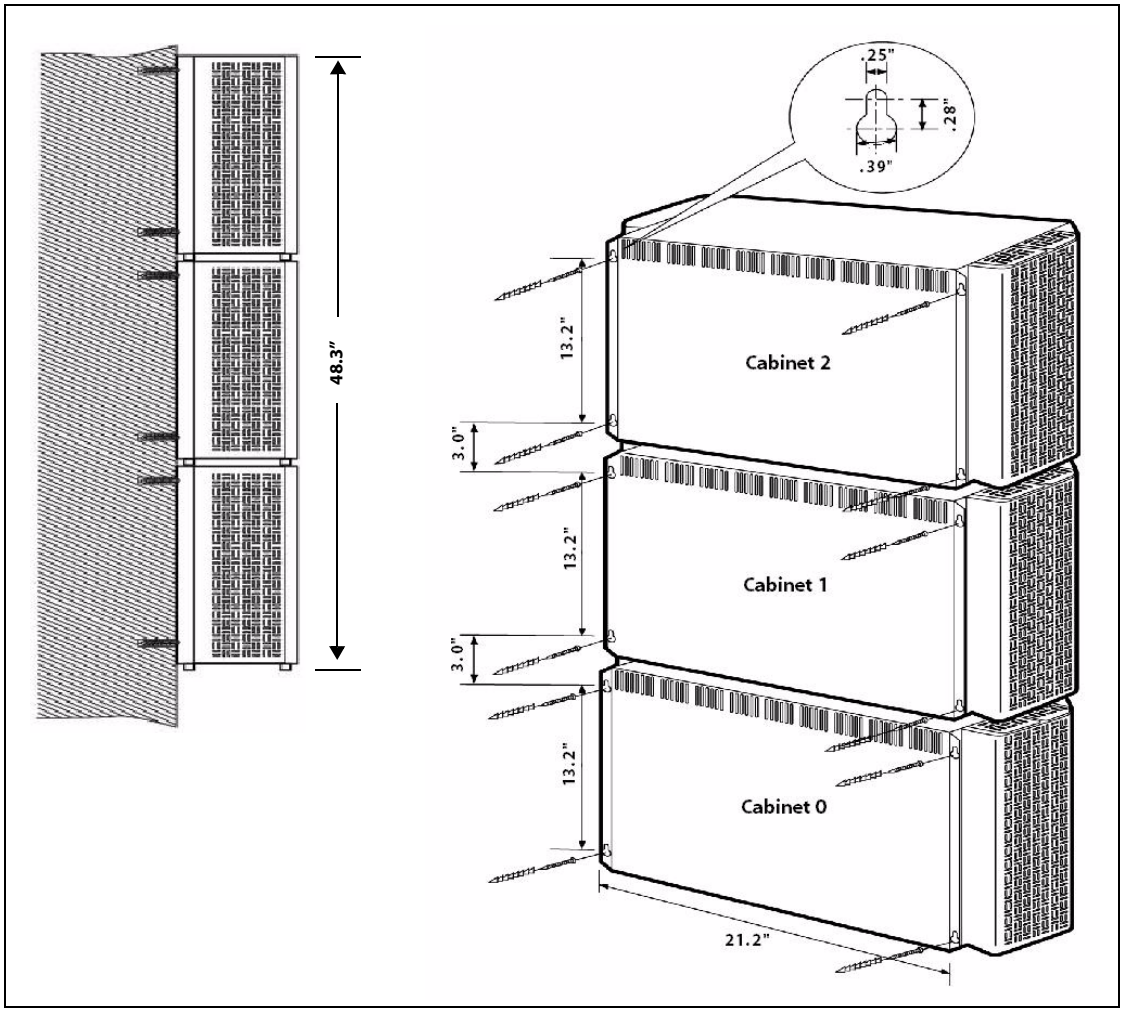


Figure 3-4: Mounting Cabinets 0, 1, & 2

Connecting Sets of Cabinets

Connect the first set of Cabinets (0-2) to the second set of Cabinets (3-5) with the Linked Cable as shown in *Figure 3-5*. The Linked Cable connection is between the MPBE in Cabinet 0 and the LMUE in the slot marked for MPB in Cabinet 3.

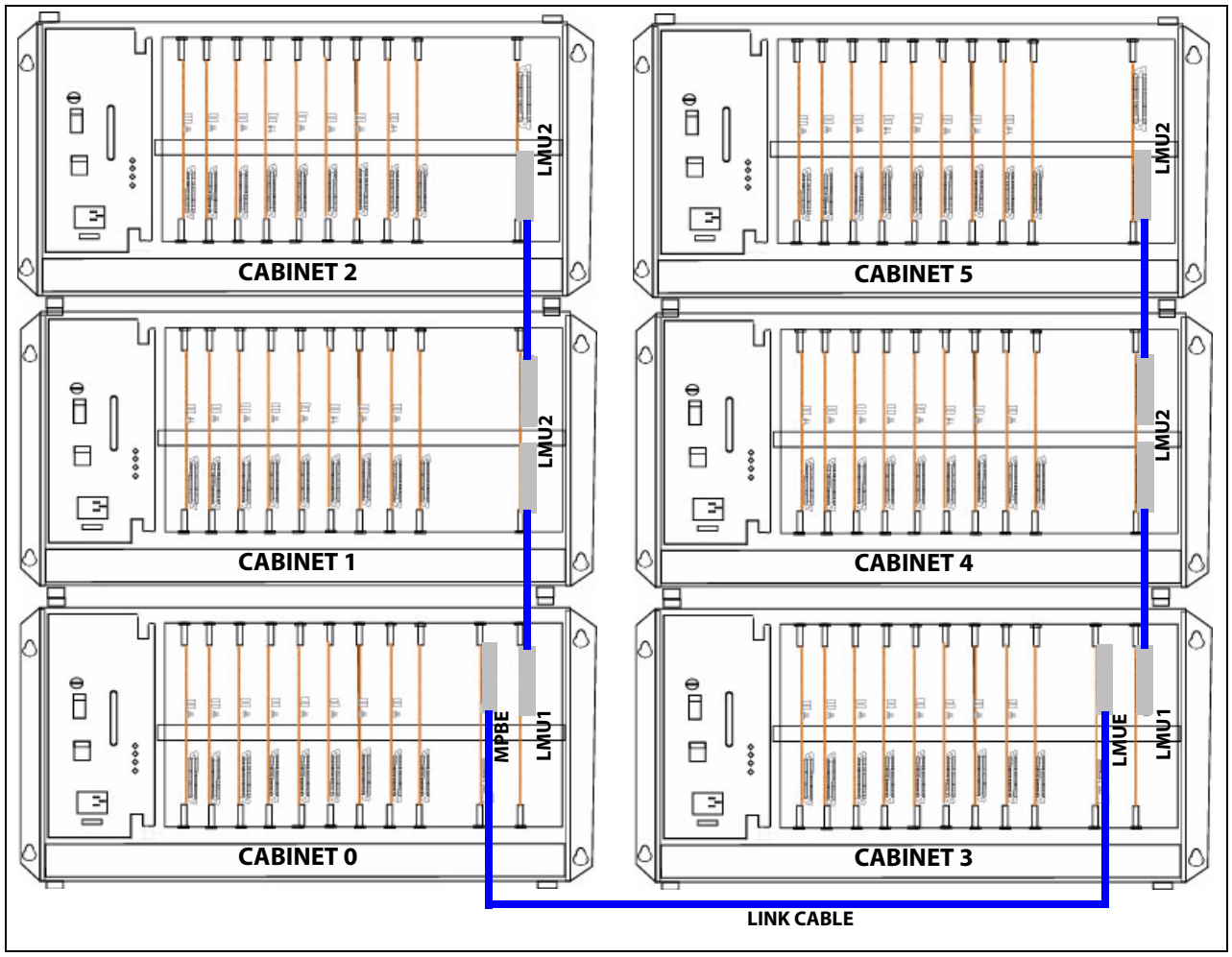


Figure 3-5: Connecting Sets of Cabinets

KSU Grounding

To ensure proper system operation and for safety purposes, a good earth ground is required. A metallic cold water pipe usually provides a reliable ground. Carefully check that the pipe does not contain insulated joints that could isolate the ground path. If insulated joints exist, another earth ground source must be used or, if allowed, the joints may be bridged.

A #14 insulated AWG or larger copper wire should be used between the ground source and the KSU. The wire should be kept as short as possible. It is recommended that the wire be no longer than 25 feet.

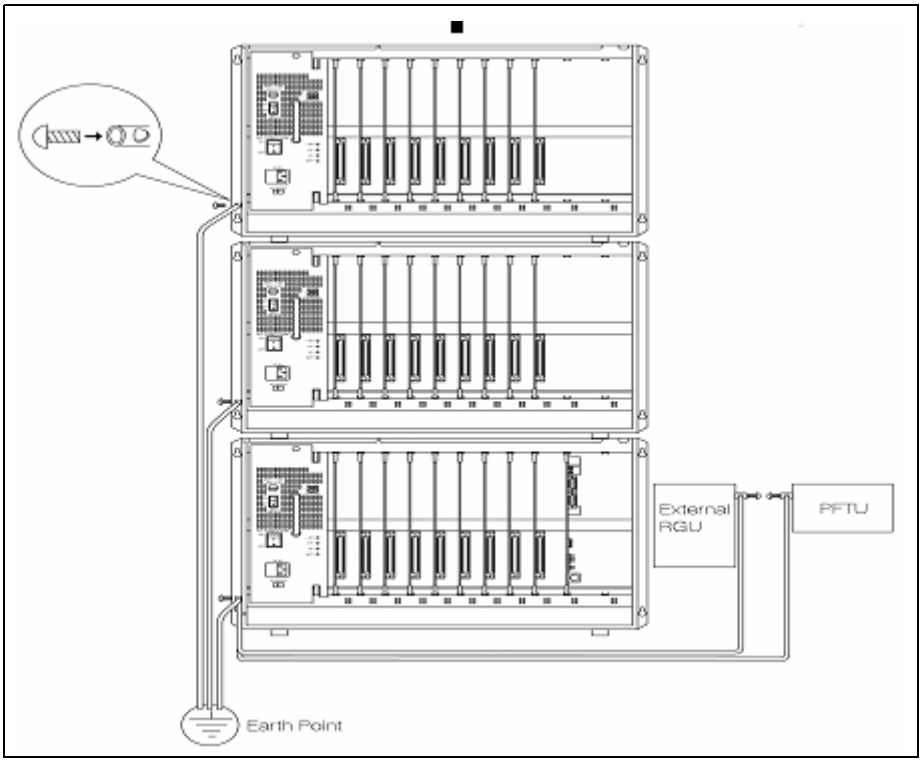


Figure 3-6: Earth Cable between KSU and External RGU

Grounding Instructions

1. Remove about 1½ inches of insulation from both ends.
2. Attach one end of the wire to the Ground Lug on the lower left side of the Cabinet 0 by inserting the wire under the lug screw and tightening the screw securely.
3. Attach the other end of the wire as appropriate to the ground source.
4. Take a DC resistance reading and an AC Volt reading between the chassis ground point (cold water pipe) and AC ground (third wire AC ground).

   The limit is 1V AC and 5 Ohms DC resistance. If a higher reading is obtained, choose a different chassis ground point and repeat this step until a suitable ground point is found.

Note	*Grounding to an electrical conduit is NOT considered a good ground!*

Power Line Surge Protection

The AC outlet should be equipped with an additional power line transient surge protection device. Systems using such devices are more resistant to damage from power line surges than unprotected systems. Power line surges often occur during switching operations and especially during violent thunderstorm activity.

Protector Specifications -- Installation of a surge protector meeting these specifications prevents or minimizes the damage resulting from power line surges.

- The Isolation Transformer/Surge Protector shall be a 15 amp self-contained unit that plugs into a standard grounded 117 VAC wall outlet.
- The wall outlet must be designed to accept a 3-prong plug (2 parallel blades and ground pin).
- The protector should be fast operating and capable of protecting transients greater than 200 volts.

Note	*It is recommended that the AC outlet be equipped with an isolation transformer/surge protection device that utilized MOV protection.*

Lightning Protection

The system provides secondary protection per UL 1459 Specifications. Primary protection circuitry is the installers responsibility and should be installed per the National Electric Code (NEC).

KSU AC Power Plug

1. Before plugging the KSU power cord into the AC source, verify that the Power switch on the AC/DC front panel is in the OFF position.
2. Plug the KSU power cord into the AC outlet and turn the AC/DC Power switch to ON. The red/green LED on the PSUs should illuminate.

Optional Mounting Rack

1. To mount rack, use the optional BRK (Bracket for installation on the rack). Usable rack is the standard 19″ rack. Any 19″ open rack can be used.
2. After placing the rack on a flat floor, attach the Cabinet to the rack using provided BRK with bolts and nuts on both sides as shown in *Figure 3-7*.

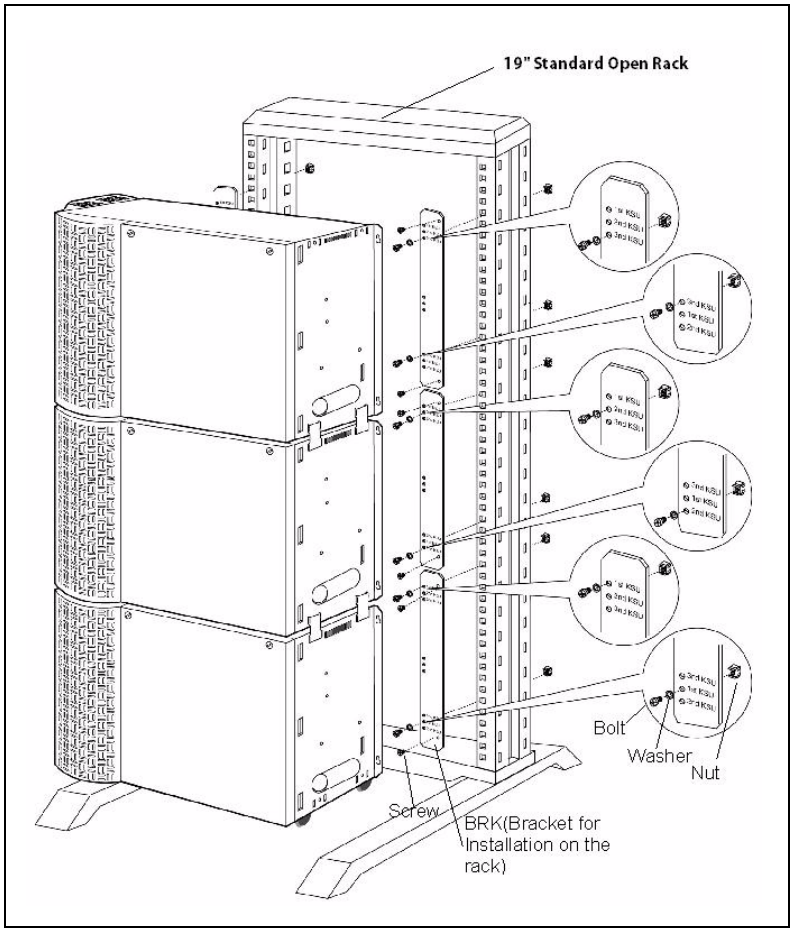


Figure 3-7: Optional Rack

Ring Generator Unit Installation

The Ring Generator Unit (RGU3) is needed if a SLIB is to be installed in a Cabinet. The RGU3 provides ring voltage and a Message Wait Source. A cable for connecting the RGU3 and KSU is provided.

1. Mount the unit inside the Cabinet to the bottom side panel on the right with the two screws provided.
2. Connect the unit to the backplane via CN14 connector (marked on PCB).

When installing a ring generator, ensure that the system is turned off and unplugged from the power outlet. Installing the ring generator while the system is up and running will permanently damage the system. Once damaged, none of the single line devices will ring and the KSU must be replaced.

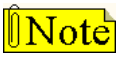
Power Supply Unit Installation

The Power Supply Unit (PSU) provides power for the system boards and telephones, converting AC voltage input to appropriate DC voltages.

Voltage Selector Switch

The PSU can operate from either 110/115 or 220/230 Volts AC based on the setting of the AC SELECT switch on the lower front of the PSU.

- If local AC is 115 volts, move the switch to the left position to display "115".
- If local AC is 230 volts, move the switch to the right position to display "230". Default setup of the product is 115VAC.



Although, the PSU is equipped with power-line transient protection, an external Power Line Surge Protector should be installed at the AC outlet to give additional protection, especially during violent thunderstorm activity. Refer to "Lightning Protection".

The range of input voltage and the fuse rating of the PSU are as follows:

Table 3-1: Fuse Rating of the PSU

Position of AC SELECT switch	The Range of Main Input Voltage	Fuse Ratings
115V	103V AC - 127V AC	8A @ 125V
230	206V AC - 254V AC	5A @ 250V

Power Capacity

The power capacity of the PSU is as follows:

+5V DC	-5V DC	+30V DC	Battery Charging Current
10A	1.5A	8.4A	1A

Before Installation -- Ensure that the AC plug connected to Cabinet 0 is NOT plugged into the AC outlet.

1. Place the PSU in the left-most slot in Cabinet 0, aligning the card guides with the PSU PCB and PSU frame flanges.
2. Slide the PSU into place using the ejectors to seat the PSU fully in the Cabinet.
3. Then affix the PSU to the Cabinet with the two screws provided.

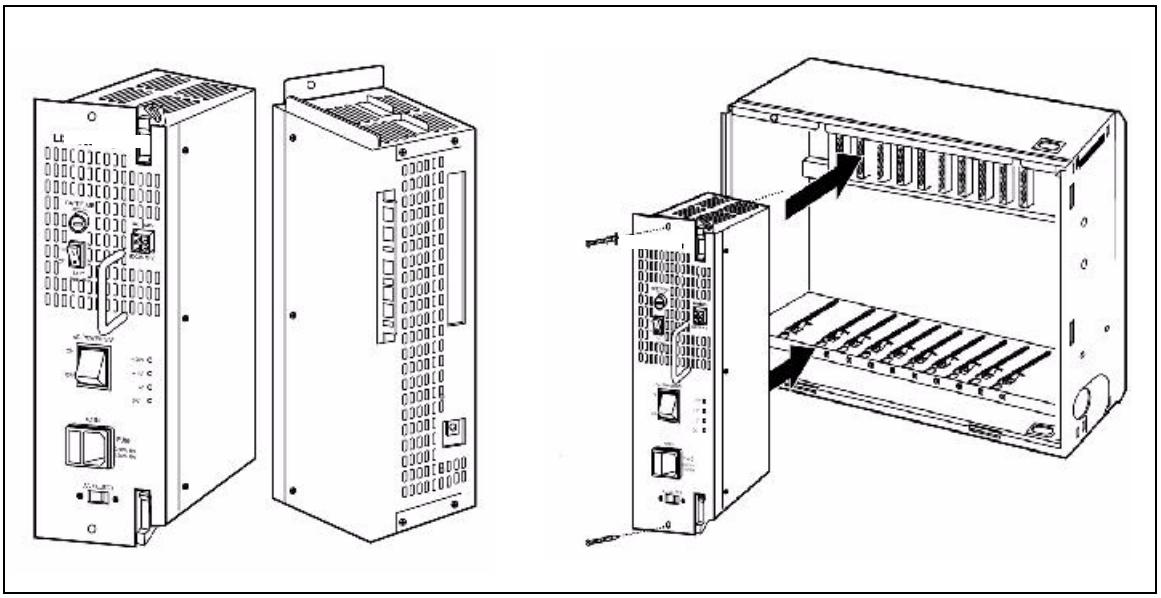


Figure 3-8: PSU Installation

PCB Installation

PCB Handling and General Installation

	While it is possible to install and remove system cards with power on, it is not recommended and could void your warranty. *The system PCBs contain digital circuitry which, while extremely reliable, can be damaged by exposure to excessive static electricity. When handling PCBs, a grounded wrist strap should be used to protect the boards from static discharges.*

Inserting a PCB

1. Hold the PCB by the ejector tabs and, with the components facing right, align the top and bottom edge of the PCB in the card guides.
2. Slide the card into the system and use the ejectors to seat the PCB firmly into the backplane connector.

Removing a PCB

Reverse the *Inserting a PCB* procedure. Installation method of the PCB is shown in *Figure 3-9*.

There is a ground tab located on the top and bottom of each PCB toward the front end of the card. There is also a ground tab located to the right of each card guide in each cabinet. Make sure when the PCBs are inserted into the card guide and secured in their respective card slots, that the ground tab on each card mates with the ground tab on each card guide. This ensures a good ground potential to reduce RFI and EMI interference possibilities.

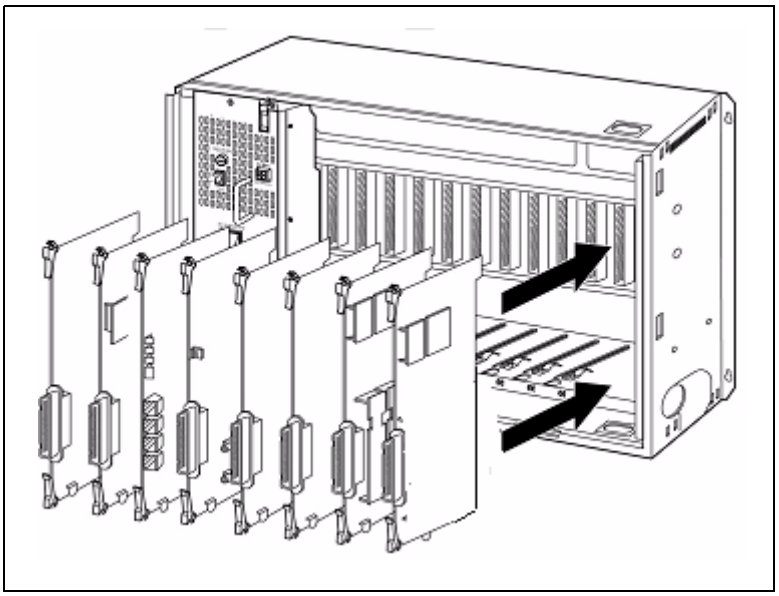


Figure 3-9: PCB Installation

Main Processing Board Installation

The Main Processing Board (MPB) is installed in the MPB PCB card slot (slot MPB) of Cabinet 0. MPBs include the MPB1, MPB2, and MPBE. The MPB may be equipped with two add-on boards: a PMU for software programming and a MODU for modem access to the system.

Note	*To view the current MPB software version on your LCD, use feature code 605.* *To upgrade your MPB software, first use feature code 609 to view your MPB serial number. Provide this serial number to Vodavi and you will be provided with a new software identification code for the upgrade. Enter the new software identification code after you access feature code 610.*

Lithium Battery

The MPB contains a lithium dry-cell battery to maintain memory and real-time clock functions. The battery is soldered on the MPB and connected to the circuitry by the ON-OFF Dip Switch. Make sure the switch is set to the ON position before installing the MPB.

DIP Switch Positions (SW3)

The MPB also has an eight-position DIP switch, SW3. The default setting is: All ON position. The function of each switch position is as follows:

Table 3-2: Dip Switch Settings (SW3)

Switch	Function	OFF	ON
1	N/A	RESERVED leave these switches in the ON position	
2	N/A		
3	N/A		
4	N/A		
5	N/A		
6	Execute hardware tests at startup	Disable	Enable
7	Power up status trace of board (startup messages)	Disable	Enable
8	Database default on power up	Disable	Enable

Note	*Use extra care when removing RS-232 cables from the MPB or SIU boards. Hold the MPB/MISB card in the card slot before removing the RS-232 cable. Failure to perform this action may result in the MPB/MISB card being pulled from its slot.*

Before programming the system, dip switch 8 (database default switch) should be placed in the on position and power cycled off and on to initialize the system database to default. Once the database has been initialized, switch 8 should be placed in the off position to protect the database.

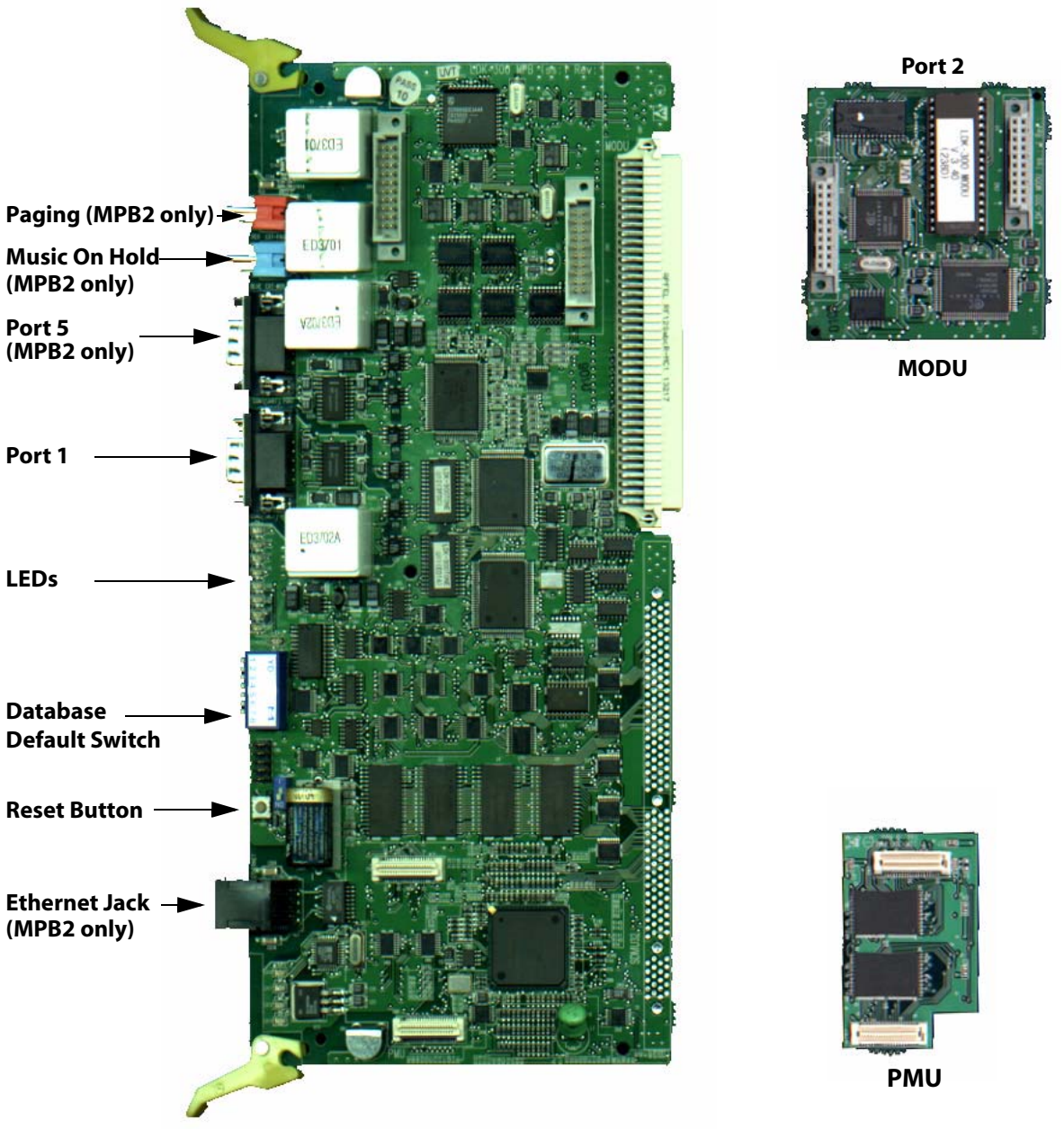


Figure 3-10: MPB1/2, PMU, and MODU Configuration

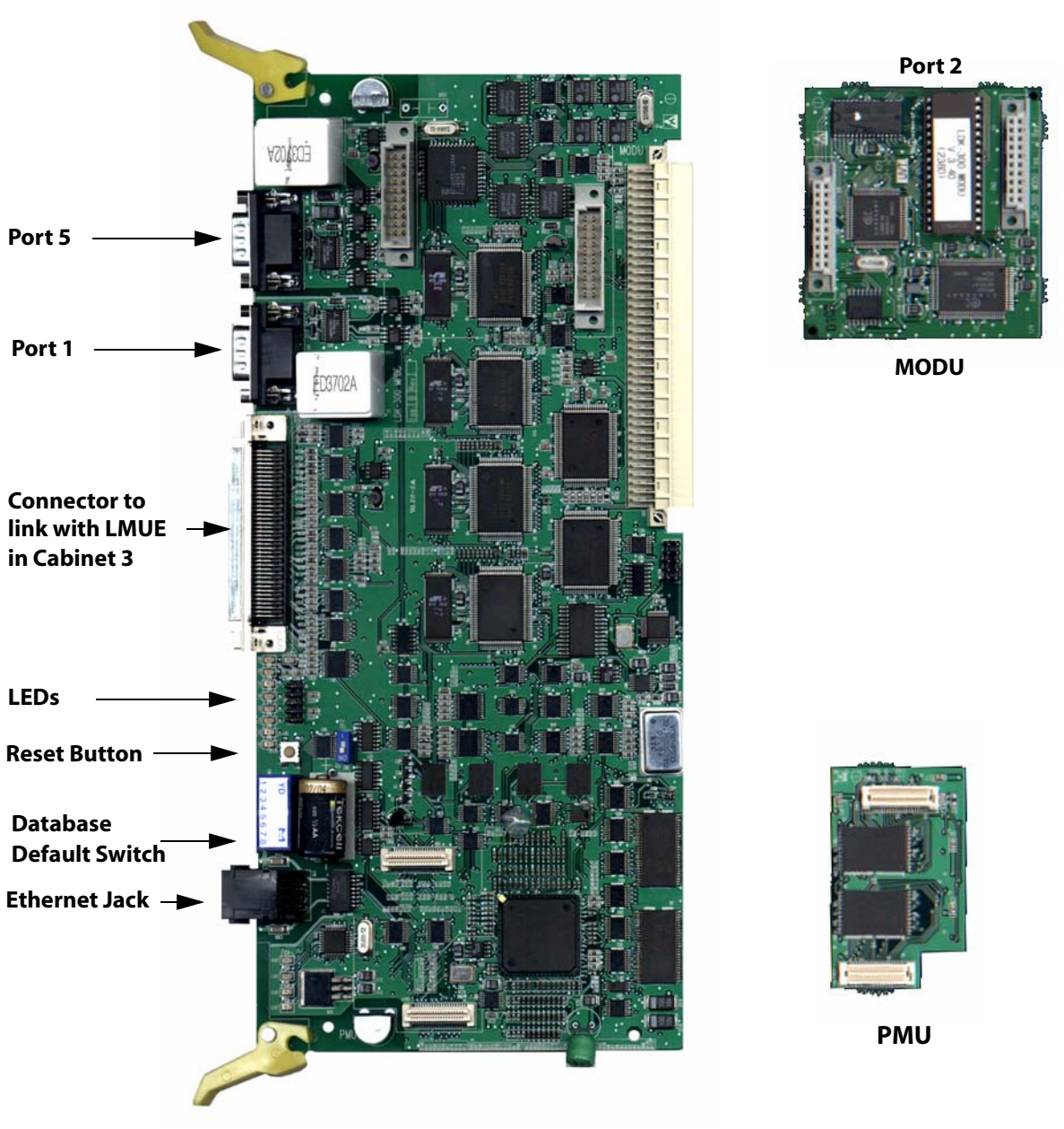


Figure 3-11: MPBE, PMU, and MODU Configuration

Ethernet Port

The MPB2 and MPBE have an Ethernet port. This communications port can be used for several advanced features of the *XTS-IP* system. It contains a bi-directional interface using TCP/IP communication protocol. It has the ability to use a TAPI interface and send standard RS-232 commands.

The Ethernet port can be used for administration programming. A password challenge is presented upon entry into the system via the Ethernet port.

The Ethernet port must be configured in FLASH 46 programming (Buttons 1, 2, & 3). Refer to the Programming and Operations Manual.

Program Module Unit

The Program Module Unit (PMU) is installed on the MPB and contains the software used by the system to control features and their function. Install the PMU before installing the MPB.

Installing the PMU

1. Unpack the PMU from its antistatic conductive bag.
2. Locate the CN8 and CN9 connectors on the MPB. Locate the CN1 and CN9 connectors on the PMU.
3. Position the PMU so that CN1 and CN2 align withCN8 and CN9 respectively on the MPB. Push the PMU onto the respective connectors and make sure it seats properly.

Modem Unit

The Modem Unit (MODU) provides an asynchronous modem for access to the system database and fault reporting features from a remote site. The module is optionally installed on the MPB and incorporates a 19,200 bps modem. The modem may be connected to a preselected CO Line through the system switching matrix.

Installing the MODU

1. Unpack the MODU from its antistatic conductive bag.
2. Locate the CN1 and CN2 connectors on the MPB. Locate the CN1 and CN2 connectors on the MODU.
3. Position the MODU so that CN2 and CN1 align with CN1 and CN2 respectively on the MPB. Push the MODU onto the respective connectors and make sure it seats properly.

Link Module Unit

The Link Module Unit (LMU) provides a link between the Cabinets of the KSU. LMU1 must be installed to connect Cabinet 0 to Cabinet 1 and Cabinet 3 to Cabinet 4. LMU2 is used to connect Cabinets 1 and 2 and to connect Cabinets 4 and 5. Signals are transmitted or received via linked cable. Set the clock source switch of LMU1 to the up position for T1 clock source chain and to the down position for PRI/BRI clock source chain.

The LMUE is used to connect the first set of Cabinets 0, 1, and 2 with the second set of Cabinets; it must be installed in Cabinet 3 and is connected with Link Cable to the MPBE in Cabinet 0. Signals are transmitted or received via linked cable as shown in *Figure 3-5: Connecting Sets of Cabinets*.

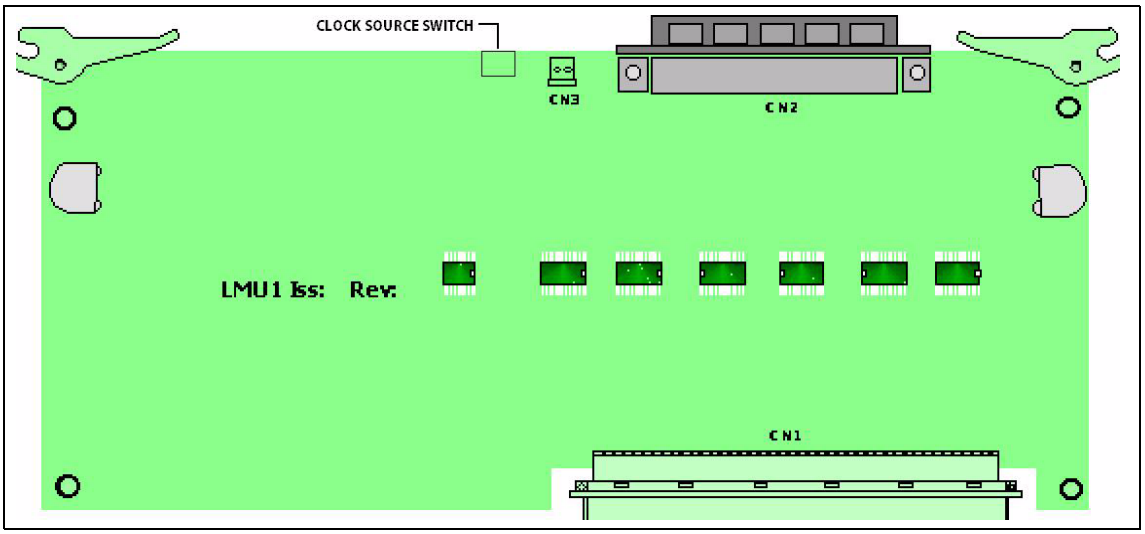


Figure 3-12: LMU1 Board Configuration

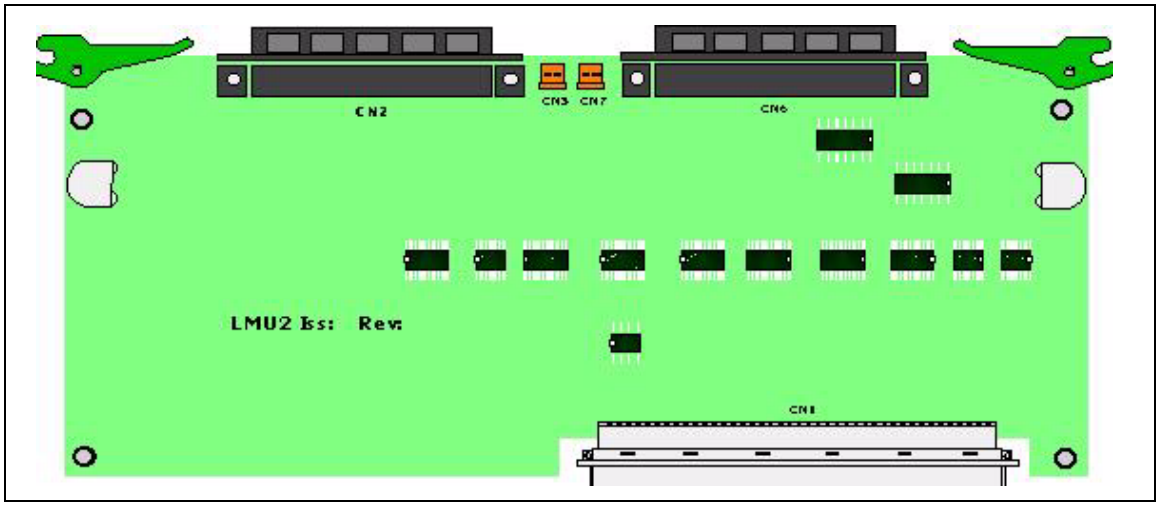


Figure 3-13: LMU2 Board Configuration

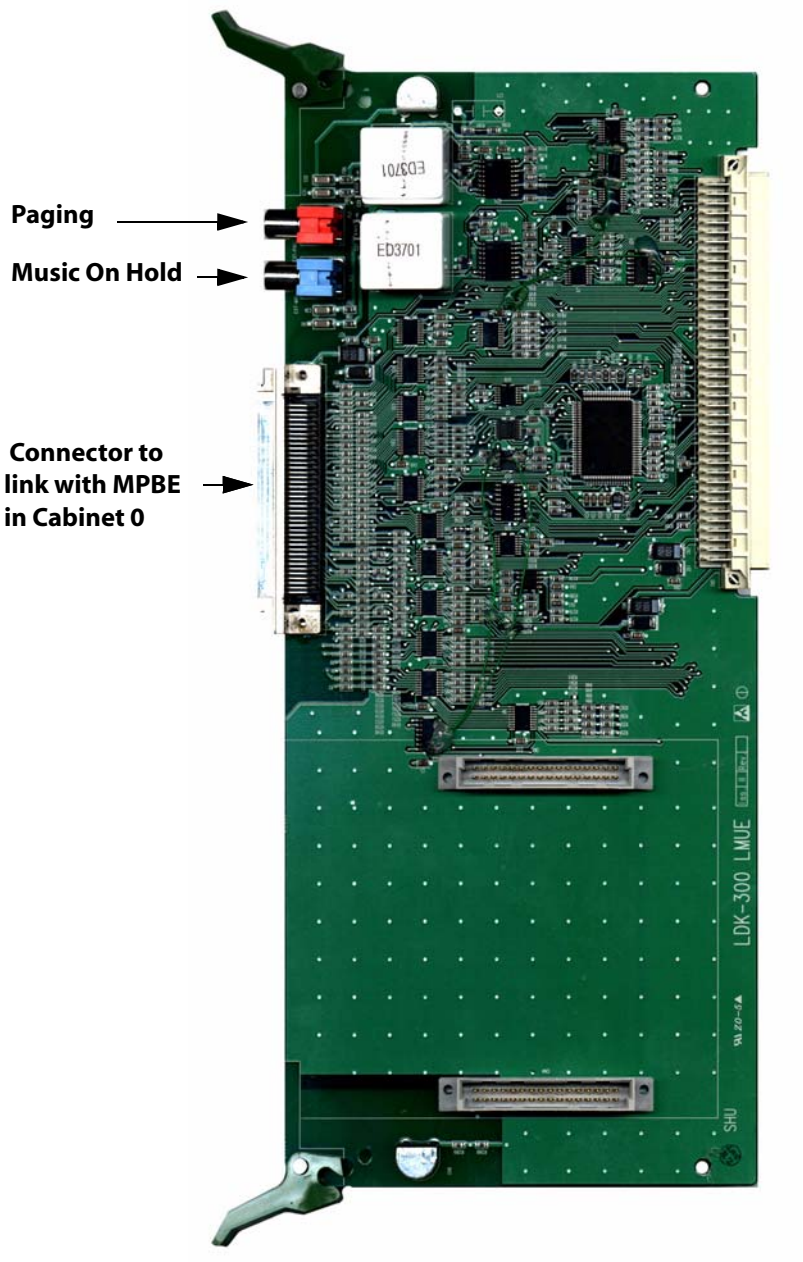


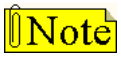
Figure 3-14: LMUE

Miscellaneous Interface Unit Installation

The Miscellaneous Interface unit (MISB) contains an External Music port (MOH/BGM), an External paging port, and four dry contacts. Optionally, the MISB is equipped with two serial interface ports by installing the Serial Interface Unit (SIU) daughter board. The SIU should be installed if more than two serial communication devices are to be connected to the system.

Table 3-3: MISB Connector Functions

Connectors / Switches	Function
CN1	SIU Connection
RJ21X	RJ21-type female connector (25-pair Amphenol) for External Paging, External MOH, Relay contacts, and Alarm Input



The MISB should be inserted into slot 8, Cabinet 0.

Use extra care when removing RS-232 cables from the MPB or SIU boards. Hold the MPB/MISB card in the card slot before removing the RS-232 cable. Failure to perform this action may result in the MPB/MISB card being pulled from its slot.

The MISB consists of:

- External page ports from the amphenol connector on the front edge of the MISB. These ports are connected to transformers, providing a 600 ohm impedance.
- Music inputs from the amphenol connector on the front edge of the card.
- Four independent relay contacts through the amphenol connector on the front edge of the MISB. These contacts are controlled by software from entries in the system database. Control signals are sent by the MPB. The output drives the relay coils, controlling the state of the 1 amp, 24V relay contacts.

Table 3-4: MISB Wiring

Pair	PIN #	Color	Description
1	26 1	WH/BL BL/WH	RELAY1R RELAY1T
2	27 2	WH/OR OR/WH	RELAY2R RELAY2T
3	28 3	WH/GN GN/WH	RELAY3R RELAY3T
4	29 4	WH/BN BN/WH	RELAY4R RELAY4T
5	30 5	WH/SL SL/WH	
6	31 6	RD/BL BL/RD	
7	32 7	RD/OR OR/RD	
8	33 8	RD/GN GN/RD	
9	34 9	RD/BN BN/RD	
10	35 10	RD/SL SL/RD	
11	36 11	BK/BL BL/BK	BGM/MOH1R BGM/MOH1T
12	37 12	BK/OR OR/BK	BGM/MOH2R BGM/MOH2T
13	38 13	BK/GN GN/BK	EXP1R EXP1T
14	39 14	BK/BN BN/BK	EXP2R EXP2T
15	40 15	BK/SL SL/BK	
16	41 16	YL/BL BL/YL	
17	42 17	YL/OR OR/YL	
18	43 18	YL/GN GN/YL	ALARM - R ALARM - T
19	44 19	YL/BN BN/YL	
20	45 20	YL/SL SL/YL	
21	46 21	VI/BL BL/VI	
22	47 22	VI/OR OR/VI	
23	48 23	VI/GN GN/VI	
24	49 24	VI/BN BN/VI	
25	50 25	VI/SL SL/VI	

Serial Interface Unit

The Serial Interface Unit (SIU) board is used for SMDR printout and caller ID. The system supports up to 4 Serial Interface circuits, 2 circuits on the MPB and an additional 2 circuits on the SIU board (ports 3 and 4).

The following is a list of the system's output:

On-line SMDR

ACD

Caller ID

Note	*A SIU board can only be installed on the MISB.*

Installing the SIU

1. Unpack the SIU from its antistatic conductive bag. There should also be a plastic bag with two plastic standoffs and two metal screws.
2. Push the two standoffs into the holes on the SIU board.
3. Locate the CN1 connector and the two screw holes on the MISB.
4. Push the SIU board onto the CN1 connector ensuring that it seats correctly.
5. From the back side of the MISB board, insert the two metal screws into the holes and tighten them into the bottom of each standoff to secure.

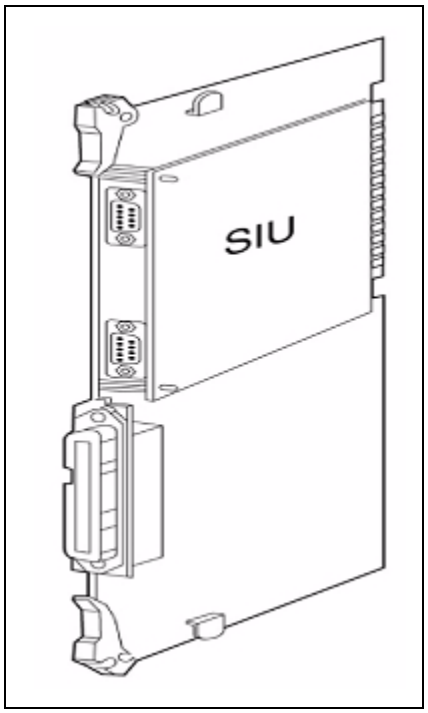


Figure 3-15: MISB & SIU Installation

CO/PBX Connections

The two types of analog CO/PBX Line interface boards available are the Loop Start CO Line Interface Board (LCOBC) and the Direct Inward Dial Interface Board (DIDB).

There are five types of digital CO/PBX Line Interface Boards available. These boards include the T1IB, PRIB, BRIB, VOIP, and VOIP24 card.

When using CO Lines as additional music inputs, keep in mind that the music source may require a talk battery in series with either TIP or Ring. This talk battery boosts the signal level sufficiently so that the CO Line interface can read the signal.

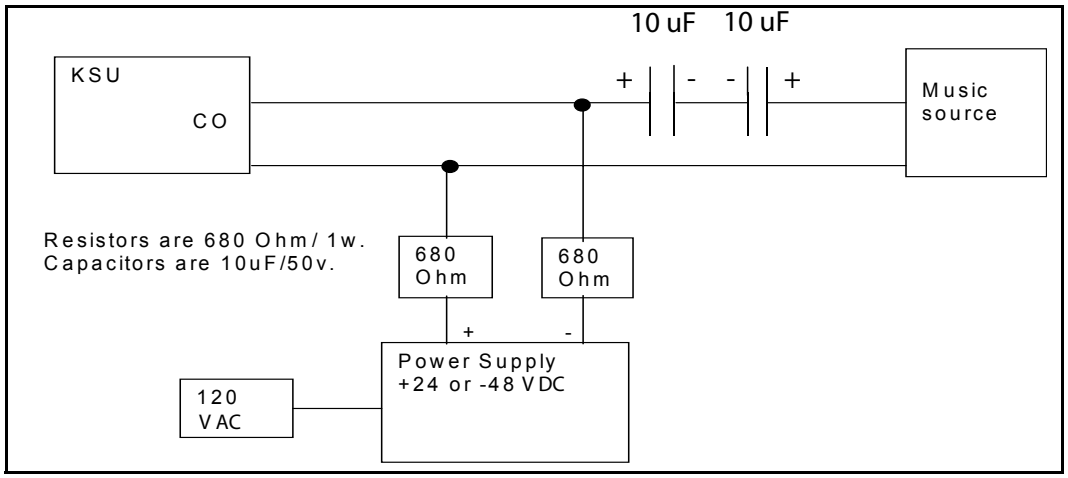


Figure 3-16: Talk Battery

Analog CO/PBX Line Interface Boards

Loop Start CO Interface Board

The Loop Start CO Interface Board (LCOBC) supports up to eight (8) Loop Start CO Lines, is Caller ID capable, and can be optionally equipped with a DTMF Receiver Unit. The LCOBC can be optionally equipped with a Caller ID Unit (CIDU).

Each Interface contains ring and loop current detection circuits, Analog-to-Digital and Digital-to-Analog conversions, and pulse and ground flash signaling circuit. The LCOBC contains LEDs that illuminate to indicate the in-use status of each CO line. The RJ21 type male connector is mounted on the front edge of the LCOBC for connecting to the CO lines.

» Add-on Boards: DTRU4 and CIDU

Installing the DTRU4 Module

DTRU4 to LCOBC

1. Unpack the DTRU4 module from its antistatic conductive bag.
2. Locate the CN1 and CN2 connectors on the DTRU4 module.
3. Locate the CN2 and CN3 connectors on the LCOBC.
4. Position the DTRU4 module so that the CN1 and CN2 connectors align with the CN2 and CN3 connectors on the LCOBC respectively.
5. Push the DTRU4 onto these connectors to seat it securely.

CIDU to LCOBC

1. Unpack the CIDU from its antistatic conductive bag.
2. Locate the CN1, CN2, and CN4 connectors on the CIDU.
3. Locate the CN10, CN11, and CN15 connectors on the LCOBC.
4. Position the CIDU so that the CN1, CN2, and CN4 connectors align with the CN10, CN11, and CN15 connectors on the LCOBC respectively.
5. Push the CIDU onto these connectors to seat it securely.

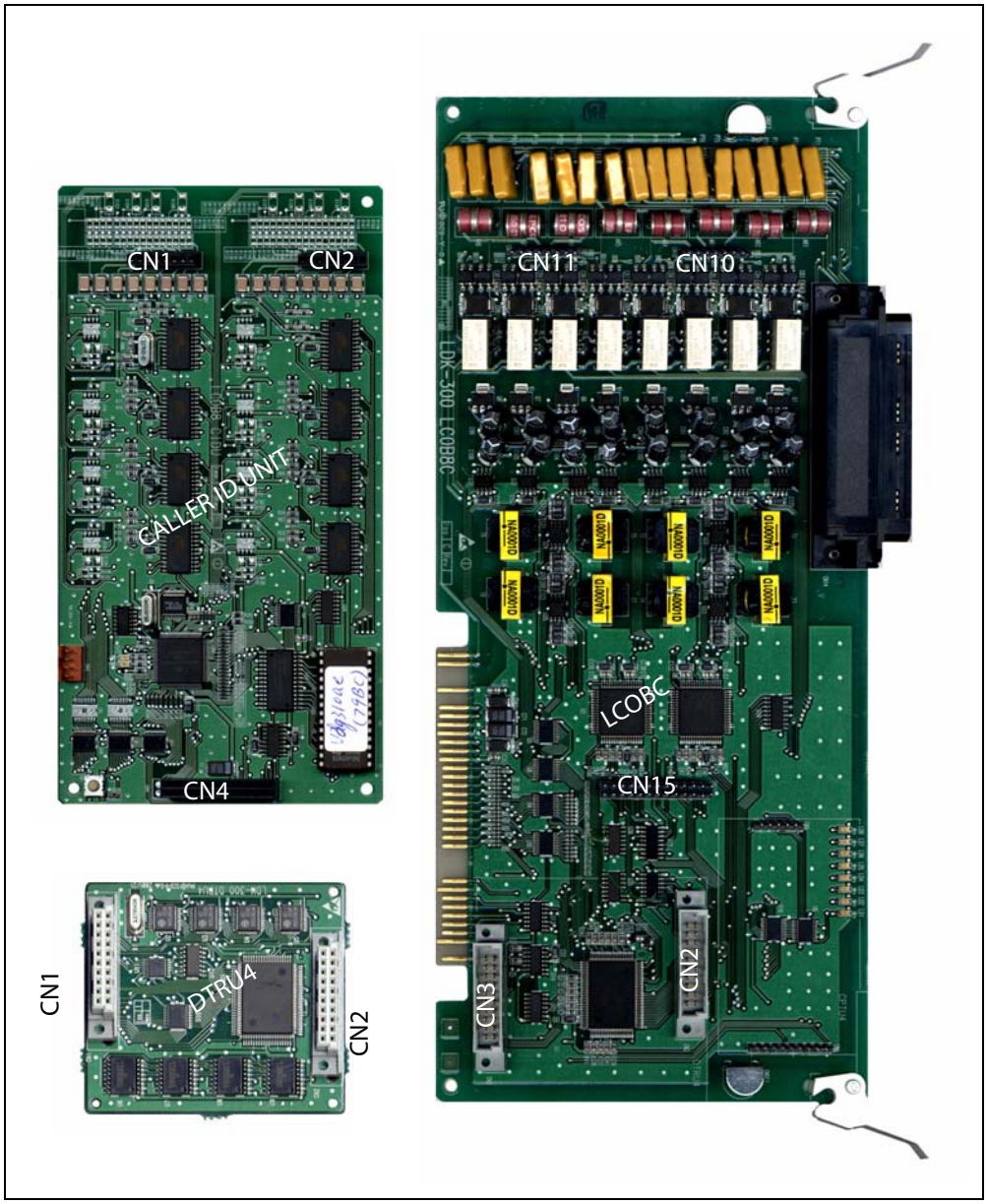


Figure 3-17: LCOBC with DTRU4 Installation

Pair	PIN #	Color	Description			Pair	PIN #	Color	Description	
1	26 1	WH/BL BL/WH	Ring 1 Tip 1			13	38 13	BK/GN GN/BK		
2	27 2	WH/OR OR/WH	Ring 2 Tip 2			14	39 14	BK/BN BN/BK		
3	28 3	WH/GN GN/WH	Ring 3 Tip 3			15	40 15	BK/SL SL/BK		
4	29 4	WH/BN BN/WH	Ring 4 Tip 4			16	41 16	YL/BL BL/YL		
5	30 5	WH/SL SL/WH	Ring 5 Tip 5			17	42 17	YL/OR OR/YL		
6	31 6	RD/BL BL/RD	Ring 6 Tip 6			18	43 18	YL/GN GN/YL		
7	32 7	RD/OR OR/RD	Ring 7 Tip 7			19	44 19	YL/BN BN/YL		
8	33 8	RD/GN GN/RD	Ring 8 Tip 8			20	45 20	YL/SL SL/YL		
9	34 9	RD/BN BN/RD				21	46 21	VI/BL BL/VI		
10	35 10	RD/SL SL/RD				22	47 22	VI/OR OR/VI		
11	36 11	BK/BL BL/BK				23	48 23	VI/GN GN/VI		
12	37 12	BK/OR OR/BK				24	49 24	VI/BN BN/VI		
						25	50 25	VI/SL SL/VI		

LCO/BC Station Ports

DID Interface Board

The Direct Inward Dial Interface Board (DIDB) provides four analog DID CO interface ports. The DIDB can be optionally equipped with a DTMF Receiver Unit (DTRU) daughter board to detect DTMF tones.

> **Note** *If a DIDB is used, a DTRU is required; it does not necessarily have to be mounted on the DIDB, but it must be installed within the system.*

Installing the DTRU Module

1. Unpack the DTRU Module from its antistatic conductive bag.
2. Locate the CN1 and CN2 connectors on the DTRU module.
3. Locate the CN1 and CN2 connectors on the DIDB.
4. Position the DTRU module so that the CN2 and CN1 connectors match up with the CN1 and CN2 connectors on the DIDB respectively.
5. Push the DTRU module onto these connectors making sure it seats properly.

Connections		Designation
Connector	**Pin #**	
J3	3	Tip 1
	2	Ring 1
	1	Tip 2
	4	Ring 2
J4	3	Tip 3
	2	Ring 3
	1	Tip 4
	4	Ring 4

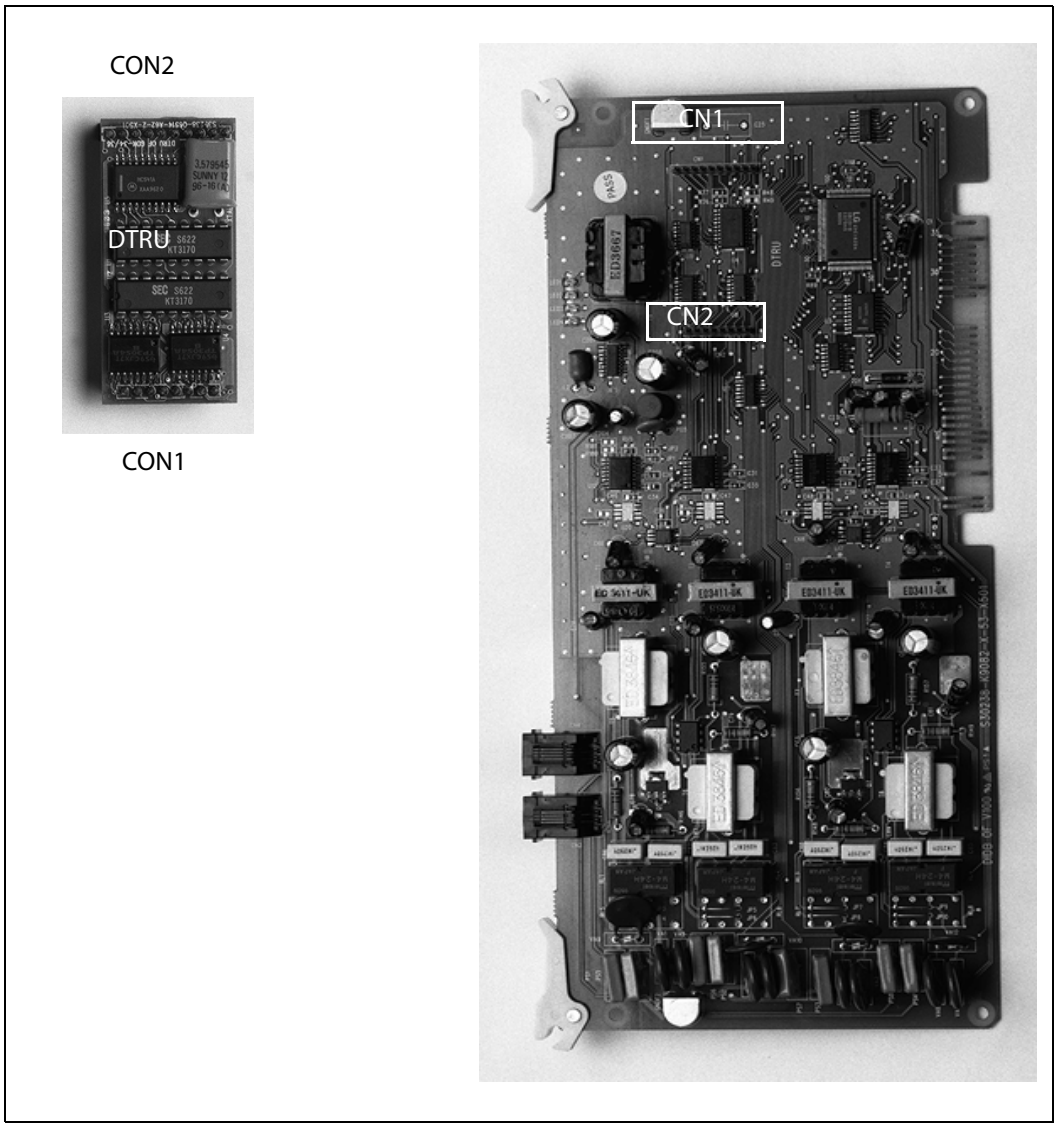


Figure 3-18: DIDB w/DTRU Installation

Digital CO/PBX Line Interface Boards

Digital CO/PBX line interface boards include the T1 interface board (T1IB), primary rate interface board (PRIB), basic rate interface board (BRIB), and Voice over internet protocol (VOIP/VOIP24) card.

T-1 Interface Board

The T-1 Interface Board (T1IB) provides the T-1 (1.544Mbps, 24-Voice Channel) digital interface circuit, control circuitry, and synchronous clock control circuits. DTMF tone detection units can be installed optionally on the T1IB. The T1IB has 8 LEDs on the front edge of the PCB which indicates errors of T-1 line, in-use status, and synchronous clock enable status.

Table 3-5: T-1 Board LEDs

LED #	Meaning	Function
1	IN USE	At least one of the 24 circuits is in use.
2	RED	T1IB is in Red alarm due to any alarm.
3	H/W TEST	Normal call processing is not available.
4	BLUE.	T1IB has detected RX_BLUE alarm.
5	YELLOW	T1IB has detected RX_YELLOW alarm.
6	OOF	T1IB is Out of Frame synchronization.
7	RCL	T1IB receives Carrier Loss (unplugged from the cable)
8	CLOCK	Clock Enable/Disable

The T1IB contains 2 switches (SW1 and SW3) and 3 connectors (CN1, CN2 and CN3). The clock selection switch is used for control synchronous clock. The Line Build-Out switch is controlled by distance between the *XTS-IP* Systems and a CSU and SW1 #4 is used for loopback control.

The clock control cable should be connected by a daisy-chain method when more than one T1IB board is installed. When the clock control cable of the T1IB is connected by daisy-chain method, the clock selection switch of the first T1IB must be placed in the Enable position and the other board should be placed in the Disable position. The Line Build-Out switch must be selected by distance between the *XTS-IP* System and a CSU and the switch selection as indicated in the following chart. If the CSU is located near the KSU, all LBO switches should be ON.

The SW1 switch #4 of the Line Build-Out switch is used for loopback control. Its switch is used only for hardware test and must be placed in the ON position for normal operation.

Table 3-6: T-1 Ordering Information

T-1 Ordering Information	
Ringer Equivalent Number	6.0P
Facility Line Interface	04DU9-B
Jack Type	RJ45

Table 3-7: T-1 Switch Positions

Distance	Switch #			
	1	2	3	4
0 to 133 feet	on	on	on	on
133 to 266 feet	off	on	on	on
266 to 399 feet	on	off	on	on
399 to 533 feet	off	off	on	on

Table 3-7: T-1 Switch Positions

Distance	Switch #			
	1	2	3	4
533 to 655 feet	on	on	off	on

- This board supports standard D4 framing format with robbed bit signaling. Extended Super Frame (ESF) format is also supported.
- The board requires an external CSU unit.
- The T1 board can accept two DTRU4 units in a daughterboard type arrangement. Each unit has four DTMF Receivers installed on it.
- The board has a 15-pin D Sub connector for connection to a CSU unit.
- The card ejector tabs are color coded white.

Functionality Description

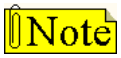
- **Automatic Number Identification (ANI)** information from the carrier is treated exactly the same as an inbound ICLID (Caller ID) number. Calls can be routed, placed in the Unanswered Call Table, sent out to the CTI Module port on a keyset, and run through the Number To Name Translation Table. The *XTS-IP* system provides call progress tones in the same manner as ICLID.
- **Dialed Number Identification Service (DNIS)** information from the carrier is treated using DID line rules. DNIS calls are routed based on the DID Routing Table.
- **ANI/DNIS** is a combined format, where the system waits for the ANI/DNIS information from the carrier. When it is received, the system routes the call using ICLID processing. If this information is not found in the ICLID Route Tables, the DNIS information is compared to the DID table for a match. The call is then routed based on the DID tables. If a match is not found on either the ANI or DNIS number, the call is routed based on normal CO line operation (CO Ringing Assignments).

The following table summarizes the operation of the system.

Table 3-8: Call Routing Criteria

ANI	DNIS	Operation
N	N	Calls routed based on normal CO operation (CO Ring Assignments.
N	Y	Calls routed based on DID tables with DID operation.
Y	N	Calls routed based on ICLID routing and ICLID operation.
Y*	Y	Calls routed on ICLID first, if no route is found, the DNIS digits are compared to the DID table. If no route is found in the DID table the call is routed based on CO line Ringing Assignments.

**If both ANI and DNIS calls are routed -- the following table summarizes what is displayed at the phone.*



The T-1 card accepts ANI/DNIS information in a DTMF format only. Some carriers do not provide ANI or ANI/DNIS in a DTMF format. Consult your local carrier for available options.

Table 3-9: Call Routing Display Format

Route Found	Type of Display	Format
ICLID	ICLID	ANI number placed in the 14-character number field, the DNIS number followed by the name programmed in ICLID translation table placed in the 24-character name field.
DID	ICLID	ANI number placed in 14-character number field. DNIS number followed by programmed name from the DID tables in 24-character name field.
NONE	ICLID	ANI number placed in 14-character number field and the DNIS number is placed in the 24-character name field.

T-1 Ordering Information: When ordering a T-1 circuit from a carrier, request either D4 framing and Alternate Mark Inversion (AMI) Line coding using the superframe (SF) or the Extended Superframe (ESF-B8ZS) format. The following are additional ordering information specifications:

Table 3-10: T-1 Ordering Specifications

If ordering…	ANI/DNIS/ DID/TIE	Loop Start/ Ground Start Signaling*
Circuit Information	2 wire	2 wire
Supervisory Signaling	TIE	Loop or Ground
Address Signaling	DTMF	DTMF
Start Dial Indicator	Wink Start	Dial Tone

** ANI/DNIS not available on Loop/Ground start signaling. If Loop Start signaling protocol is ordered, the Central Office does not provide Disconnect Supervision. However if TIE signaling protocol is ordered,*
disconnect supervision is provided. The switching equipment processes DNIS numbers received from the T-1 circuit depending on the trunk simulation.

Table 3-11: Telco to T1IB Interconnect Diagram - Pin Connections

Telco	T1IB
RJ45	DB15 Female Pin #
1-->	<--9
2-->	<--1
4-->	<-- 11
5-->	<--3

Installing the DTRU4 Modules

1. Unpack the DTRU4 modules from their antistatic conductive bags.
2. Locate the CN1 and CN2 connectors on the DTRU4 modules.
3. Locate the CN4, CN5, CN8 and CN9 connectors on the T1IB.

4. Position one of the DTRU4 modules so that the CN2 and CN1 connectors align with the CN8 and CN9 connectors on the T1IB respectively.
5. Push the DTRU4 module onto these connectors to seat it securely.
6. Position the second DTRU4 module so that the CN2 and CN1 connectors align with the CN4 and CN5 connectors on the T1IB respectively.
7. Push the DTRU4 module onto these connectors to seat it securely.

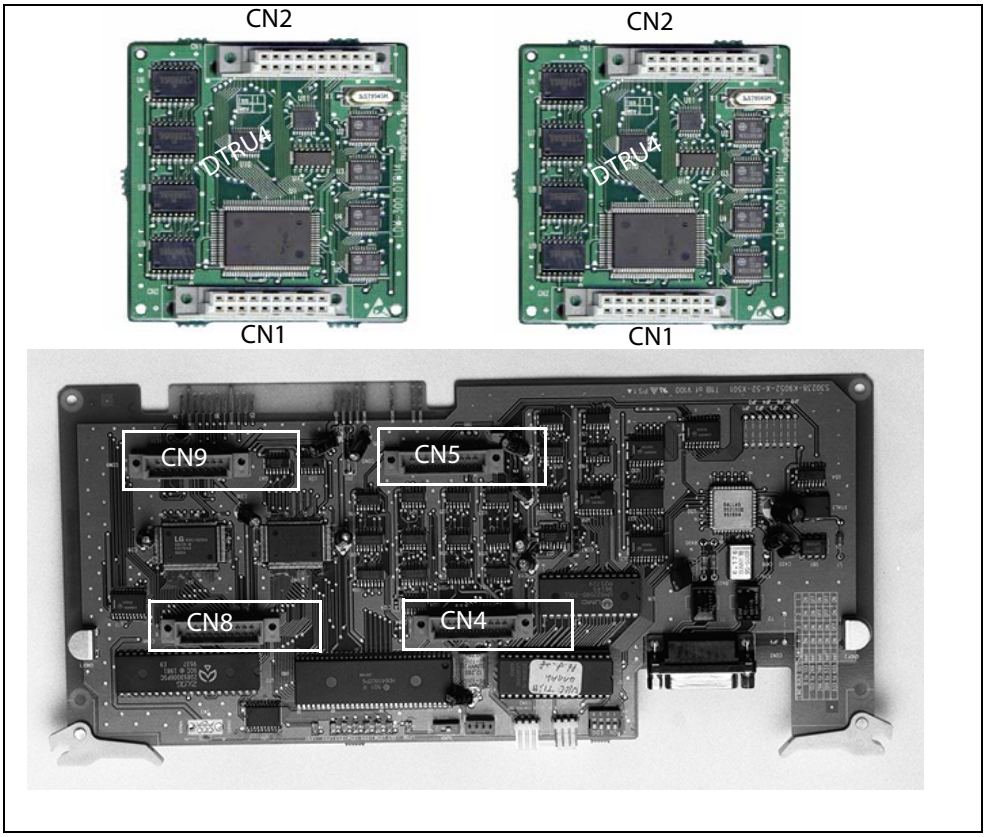


Figure 3-19: T1IB w/DTRU4 Module Installation

Primary Rate Interface Board

The Primary Rate Interface Board (PRIB) provides one Primary Rate Interface circuit. Each circuit contains 23 bearer and one data channel (23B+D). When a PRIB card is programmed into the *XTS-IP* system, the system interprets all B channels as trunks. Thus, one PRIB which contains 23B+D circuits provides 23 line appearances to the *XTS-IP* system. The PRIB card uses 24 time slots when installed. A feature of Flash 24 programming allows for partial signaling over T1IBs or PRIBs. This allows you to limit the amount of time slots used per card to four, or multiples of four up to 20.

The PRIB must usually be used in conjunction with a Channel Service Unit (CSU). Connection is made via a DB15 from the PRIB to the CSU. When networking systems that are less than 50 feet apart, no CSU is required.

The PRIB accepts two DTRU4 boards.

Table 3-12: PRIB Ordering Information

PRIB Ordering Information	
Framing	ESF
Line Coding	B8Zs
National ISDN	NI-2

Table 3-13: Telco to PRIB Interconnect Diagram - Pin Connections

Telco	PRIB
RJ45	DB15 Female Pin #
1-->	<--9
2-->	<--1
4-->	<-- 11
5-->	<--3

Installation

1. Insert the PRIB card(s) into the desired card slot.
2. If installing a single PRIB, set SW2 to the ON position.

   If multiple PRIBs are being installed, set SW2 to the ON position on the first card and SW2 on all other cards to the OFF position.

   The PRIB comes with a clock cable. This cable is used when multiple PRIB and/or digital trunk cards are to be installed in the system. The clock cable is supplied with each PRIB.
3. Connect the DB15 cable from the PRIB to the channel service unit (CSU).
4. Connect the network cable from the channel service unit to the network.
5. Refer to ISDN and T1 Clocking (later in this section) for clarification on clocking and cabling when combining BRIB, PRIB, and T1 cards in one Cabinet.

Installing the DTRU4 Modules

1. Unpack the DTRU4 modules from their antistatic conductive bags.
2. Locate the CN1 and CN2 connectors on the DTRU4 modules.
3. Locate the CN16, CN17, CN18 and CN19 connectors on the PRIB.
4. Position one of the DTRU4 modules so that the CN2 and CN1 connectors align with the CN17 and CN16 connectors on the PRIB respectively.
5. Push the DTRU4 module onto these connectors to seat it securely.
6. Position the second DTRU4 module so that the CN2 and CN1 connectors align with the CN19 and CN18 connectors on the PRIB respectively.

7. Push the DTRU4 module onto these connectors to seat it securely.

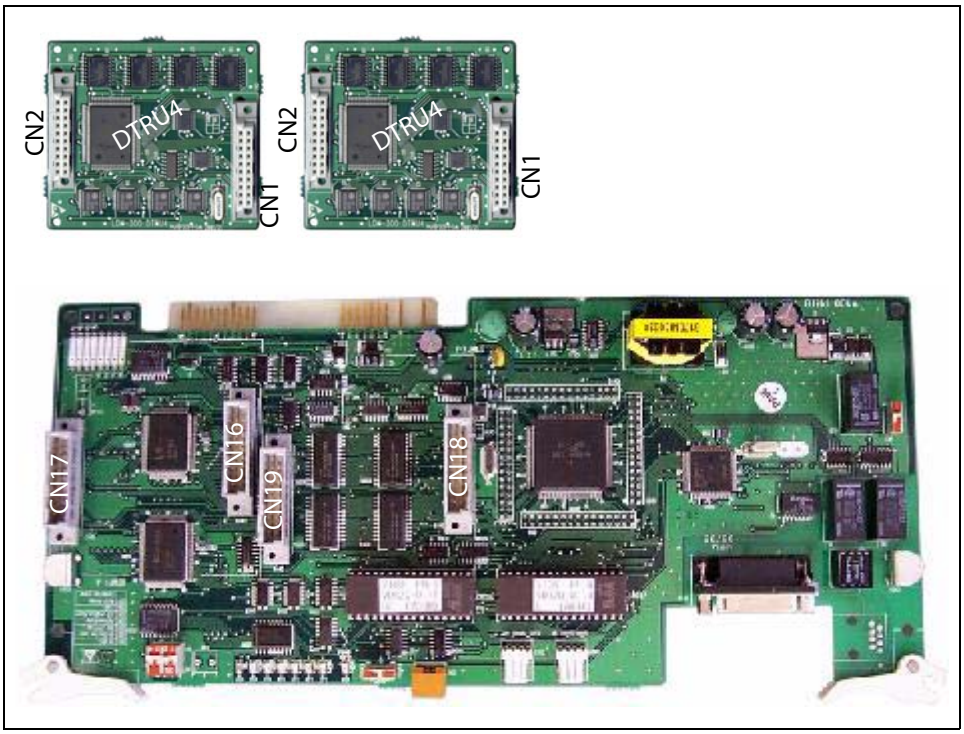


Figure 3-20: PRIB w/DTRU4 Module Installation

The PRIB is offered as a stand-alone card or as a kit which includes the PRIB, CSU, and cables.

Basic Rate Interface Board

The Basic Rate Interface Board (BRIB) interface provides four Basic Rate Interface circuits. Each circuit is comprised of two bearer (64Kbps each) and one data (16Kbps) channels (2B+D). When a BRIB is programmed into the *XTS-IP* system, the system interprets all B channels as trunks. Thus, one BRIB which contains four 2B+D circuits provides eight line appearances to the *XTS-IP* system.

The BRIB uses the U interface of the BRI standard. Connection to the network is made via RJ45 connectors on the front edge of the board. No CSU device is required to connect to the central office. The BRIB card uses eight time slots when installed.

Table 3-14: BRIB Ordering Information

BRIB Ordering Information	
Ordering Code	Capability P
National ISDN	NI-1

Installation

1. Insert the BRIB card(s) into the desired card slot. Up to seven BRIB cards can be installed in an *XTS-IP* Cabinet, with a maximum of 18 per system.
   - If installing a single BRIB, set switch 4 on SW2 to the ON position.
   - If multiple BRIB cards are being installed, set switch 4 on SW2 to the ON position on the first card and switch 4 on SW2 on all other cards to the OFF position. Switch 4 on SW2 determines if the board is the Master Clock source for any digital trunk cards in the system. Only one Master Source must be enabled in the system.
   - If installing a BRIB in a system that also has T1 or PRIB boards, use either the T1 or PRIB card as the Master Clock and set all BRIB SW2 switch 4s to OFF.
2. Refer to ISDN and T1 Clocking (later in this section) for clarification on clocking and cabling when combining BRIB, PRIB, and T1 cards in one Cabinet.

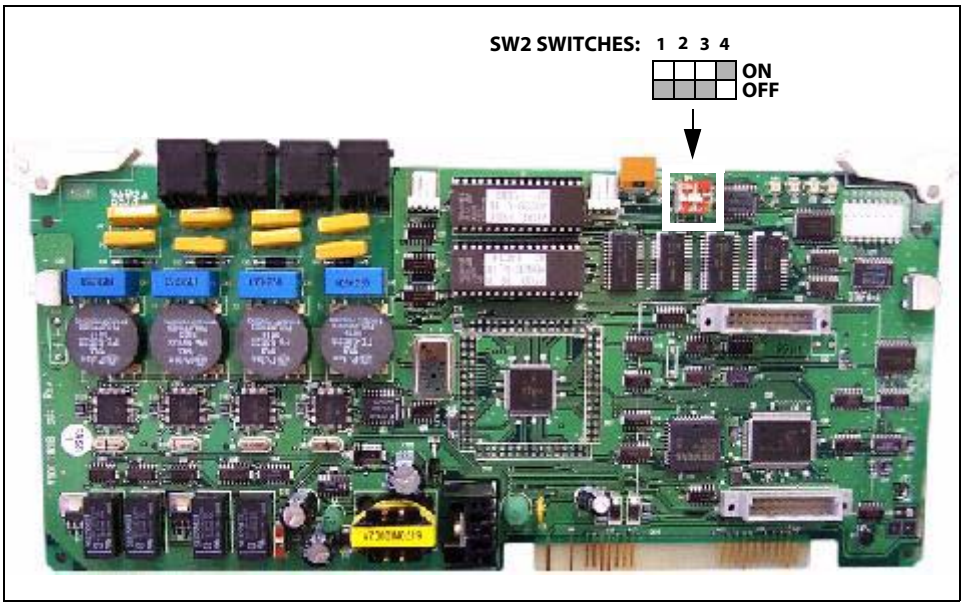


Figure 3-21: BRIB (Basic Rate Interface Board)

Voice Over the Internet Protocol Card (8-Port)

The Voice Over the Internet Protocol (VOIP) card provides up to eight lines per card (two lines per installed VOIP module). The VOIP card allows bi-directional voice communication to other H.323 Revision 3 compatible devices via an IP network such as an internal Local Area Network (LAN), the Internet, or a Wide Area Network (WAN) using the Ethernet Interface. It also provides four-digit dialing.

The VoIP card uses Transmission Control Protocol / Internet Protocol (TCP/IP) for packet delivery over an IP network. Additional standards and protocols are used to provide DTMF, voice processing, and compression.

The VoIP card can accommodate up to four VoIP modules. Each VoIP module provides capability for two ports, resulting in a maximum of eight ports when all four modules are installed.

Installation

The VoIP card can be placed in slots 1-7 of Cabinet 0 and in slots 0-7 of Cabinet 1, 2, and 3. Once the slot is identified, it takes the required time slots and deducts them from the available ones. If more then one card is identified, each card is identified in the same manner and it requires its own unique IP address.

> **Note** *The VoIP card is a combination card that has both IP Trunks and station ports. If a VoIP card is installed in any slot prior to a station-related slot, the station numbering plan will be affected. In the event that VoIP installation causes undesired effect to the station numbering plan, use FLASH 52 to revise the plan as desired.*

Table 3-15: Bandwidths

	2 Ports	4 Ports	6 Ports	8 Ports
Recommended	512K	640K	T1	T1
Minimum	256K	256K	512K	512K

Note: Assumes network latency is below 120 ms

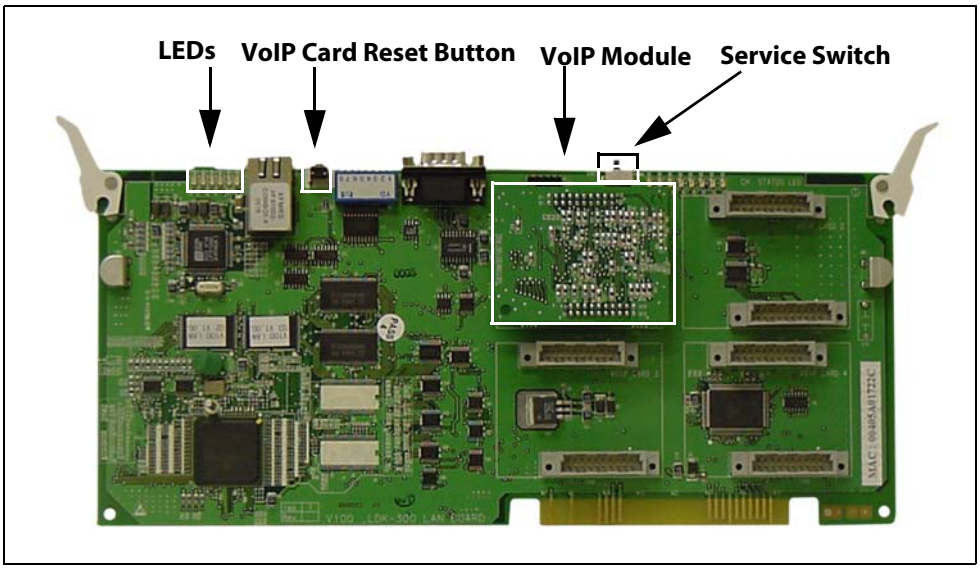


Figure 3-22: VoIP Card with One VoIP Module Installed

> **Note** *When VoIP/VoIP24 cards are used to support IP Phones, it is recommended that you install cards in Cabinet 0. If additional cards are required, use Cabinet 3 and then Cabinets 1 & 2. This is to maximize speed and efficiency.*

There are six indicator LEDs that signal the status of the LAN Ethernet connection properties. The Ethernet port auto-negotiates connection speeds and duplexing which is indicated by the following LED descriptions.

Table 3-16: VoIP Card LED Indications

LED	Indication	ON	OFF
09	LAN Speed	100 Mbps	10 Mbps
10	Rx Status	Active	Idle
11	Tx Status	Active	Idle
12	Link Status	Valid Link	No Link
13	Collision Status	Collision	No Collision
14	Half/Full Duplex Mode	Half Duplex	Full Duplex

Note: LED 09 is closest to the Ethernet port.

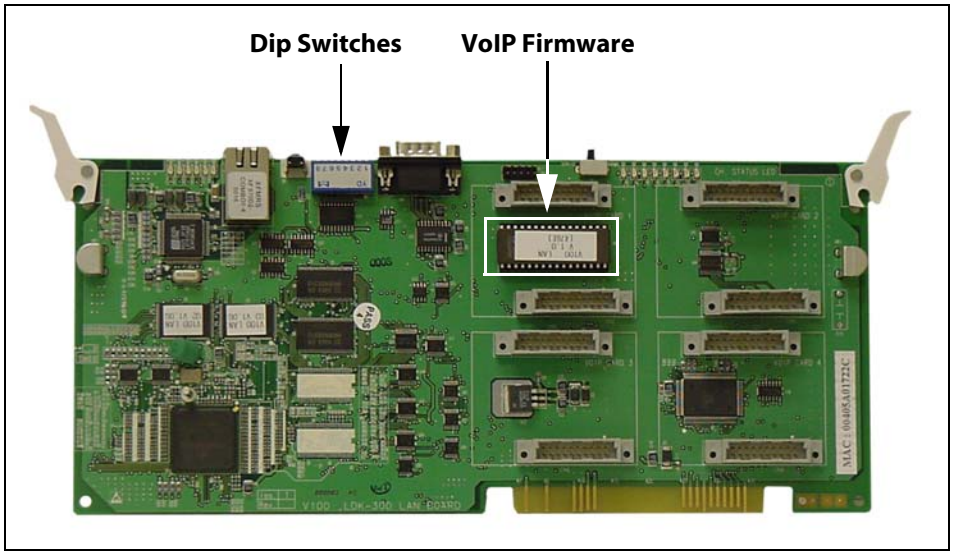


Figure 3-23: VoIP Card - No VoIP Modules Installed

Note	*Dip switch 1 is used to control the Trace Mode (ON position = Brief Trace Mode and OFF position = Detailed Trace Mode).* *Dip switches 2-8 are reserved for future use.*

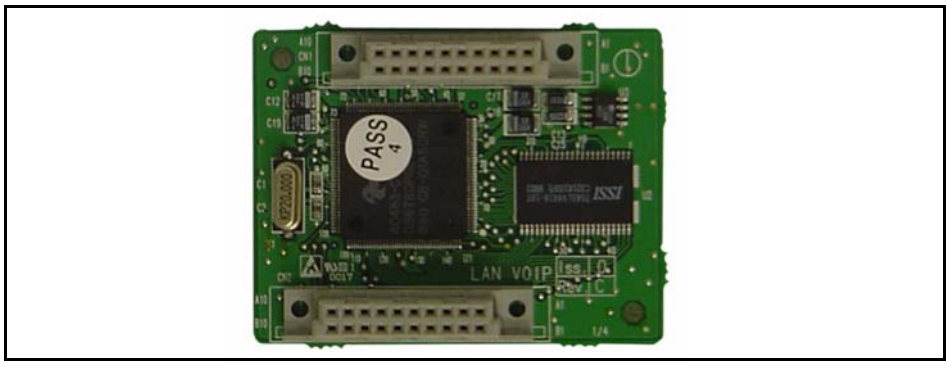


Figure 3-24: Connection Side of VoIP Module (Close-up)

Voice Over the Internet Protocol Card (24-Port)

The Voice Over the Internet Protocol (VOIP24) card provides up to 24 lines per card. The VOIP24 card allows bi-directional voice communication to other H.323 Revision 3 compatible devices via an IP network such as an internal Local Area Network (LAN), the Internet, or a Wide Area Network (WAN) using the Ethernet Interface. It also provides four-digit dialing.

The VoIP card uses Transmission Control Protocol / Internet Protocol (TCP/IP) for packet delivery over an IP network. Additional standards and protocols are used to provide DTMF, voice processing, and compression.

The VOIP24 card can accommodate a daughterboard module that is needed to realize the full 24-port capability of the VOIP24 card.

Note	*When VoIP/VoIP24 cards are used to support IP Phones, it is recommended that you install cards in Cabinet 0. If additional cards are required, use Cabinet 3 and then Cabinets 1 & 2. This is to maximize speed and efficiency.*

» Add-on Boards: Daughterboard

VoIP24 Station Port Capacity

- A maximum of 48 IP stations can be accommodated on the MPB1 system.
- A maximum of 96 IP stations can be accommodated on the MPB2/MPBE systems.
- Cabinets 0, 1, and 2 can be used in MPB2/MPBE systems. Cabinet 3 can also be used in MPBE systems.
- A maximum of 3 VoIP24 cards can be installed per cabinet.
- A maximum of 3 VoIP24 cards can be installed per MPB1 system.
- A maximum of 9 VoIP24 cards can be installed per MPB2/MPBE system.
- The VoIP24 base card (12 ports) can accommodate 24 IP stations in a blocking arrangement.
- The VoIP24 card with Daughterboard can accommodate 24 IP stations (non-blocking). Cannot accommodate a 2 to 1 ratio.

Blocking = A user goes off-hook and may not receive dialtone if no IP resources are available (busy).

Non-blocking = A user has a dedicated IP channel at all times. No busy condition.

Blocking	MPB1		MPB2		MPBE	
	Cards	Stations	Cards	Stations	Cards	Stations
VoIP24 base card	2	48	4	96	4	96
VoIP24 w/daughterboard*	--	--	--	--	--	--

* Blocking is not applicable to VoIP24 w/daughterboard

Non-Blocking	MPB1		MPB2		MPBE	
	Cards	Stations	Cards	Stations	Cards	Stations
VoIP24 base card	2	24	6	72	6	72
VoIP24 w/daughterboard	2	48	4	96	4	96

Installation

Insert the VoIP24 card into the desired slot (1-7 of cabinet 0, or 0-7 of cabinets 1, 2, and 3).

Table 3-17: VoIP24 Card LED Indications

LED	Status Indication	ON	OFF
1	CH 1, 5, 9, 13, 17, 21	Busy	Idle
2	CH 2, 6, 10, 14, 18, 22	Busy	Idle
3	CH 3, 7, 11, 15, 19, 23	Busy	Idle
4	CH 4, 8, 12, 16, 20, 24	Busy	Idle
5	VoIP24 Card DSP	Busy	Idle
6	VoIP24 Daughterboard DSP	Busy	Idle
7-8	Reserved	--	--

Note *Dip switches 1-4 are reserved for future use.*

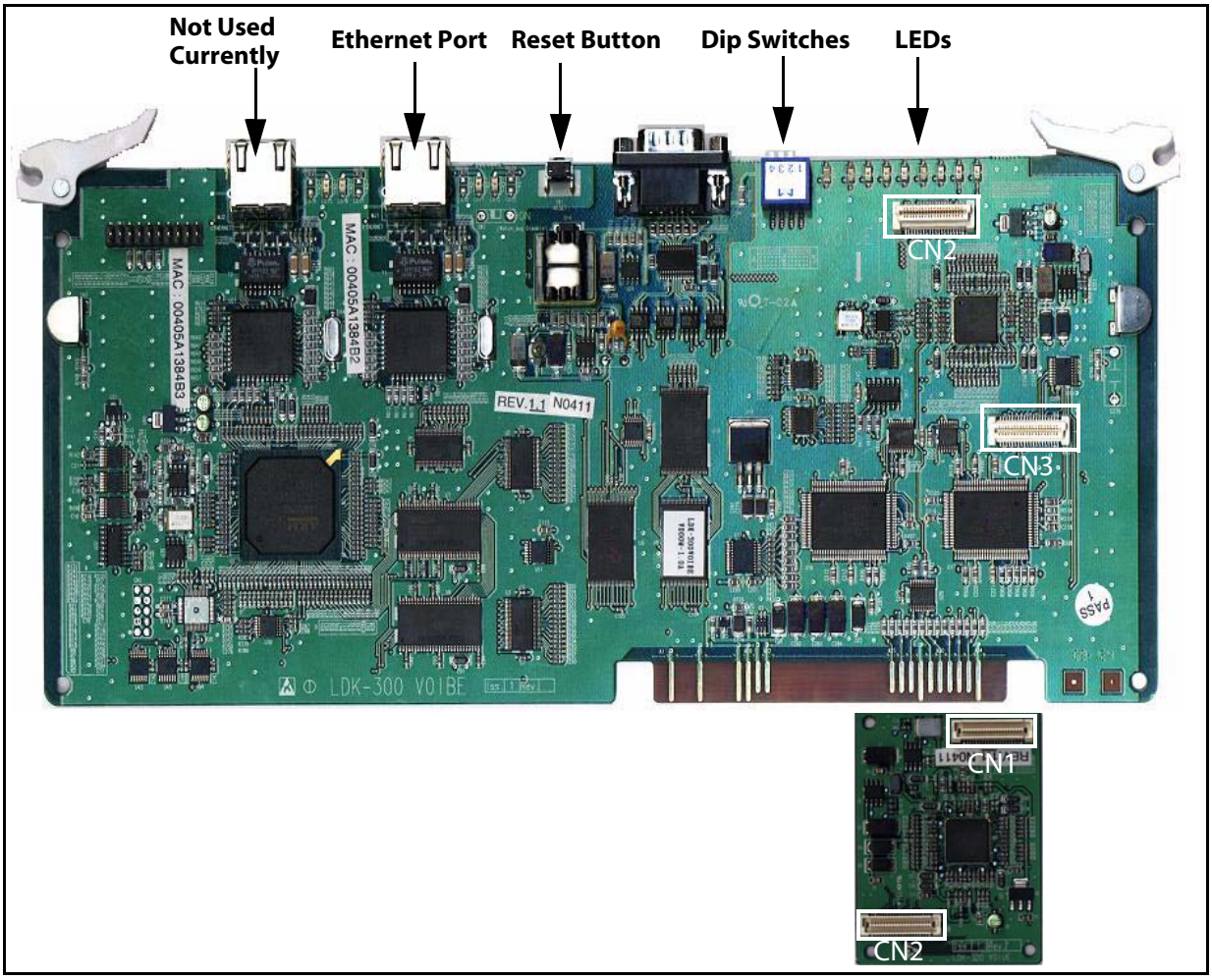


Figure 3-25: VoIP24 Card and Daughterboard

Installing the Daughterboard

1. Locate the CN1 and CN2 connectors on the Daughterboard module.
2. Locate the CN2 and CN3 connectors on the VoIP24.
3. Position the Daughterboard module so that the CN1 and CN2 connectors align with the CN2 and CN3 connectors on the VoIP24 respectively.
4. Push the Dauughterboard module onto these connectors to seat it securely.

ISDN and T1 Clocking

When combining BRIB, PRIB, and T1 cards in one KSU, specific settings and cabling are important for proper clocking. The Phase Lock Loop circuitry within the MPB synchronizes the clocking from the Central Office to the clocking of the KSU. Popping, crackling, dropped calls, and one-way transmission are usually attributed to the clocking not being synchronized correctly.

Set the clock source switch of LMU1 to the up position for T1 clock source chain and to the down position for PRI/BRI clock source chain.

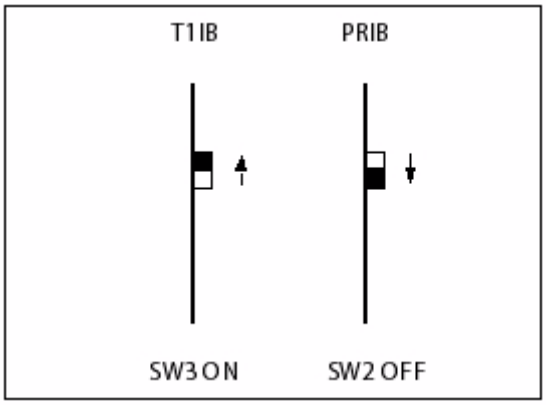
Note	*If using a point-to-point connection (e.g., networking), do not connect clock cable to a point-to-point circuit.*

Examples - Settings and Cabling

The following examples clarify the clocking and cabling for these cards:

Note	*When the switch is in the "up" position, it should be considered "ON". When the switch is in the "down" position, it should be considered "OFF".* *The cable connection follows the same logic - "up" is clock outside (ON) and "down" is clock inside (OFF). ON means that clocking is coming from outside the KSU and OFF means that clocking is coming from inside the KSU.*

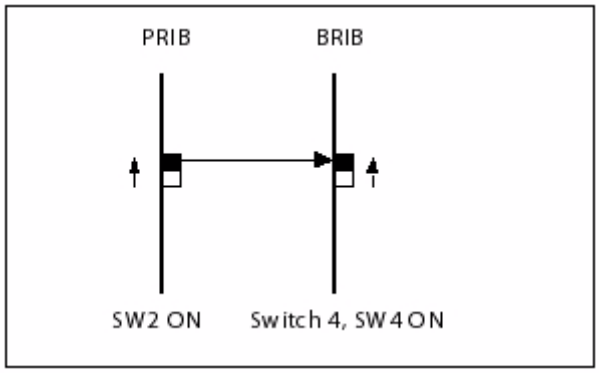
(1) T1IB and (1)PRIB



If both cards in a phone switch are connected to a telephone company clock (not point-to-point T1), put the T1 clock switch in the enable position (UP) to allow it to receive clocking from the telephone company directly, and do not install the clock cable.

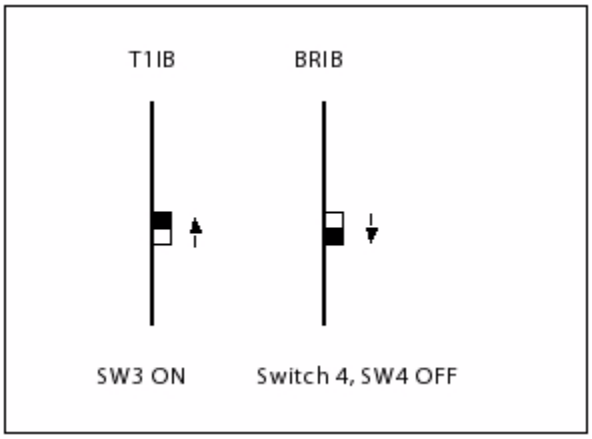
Set the PRIB clock switch in the disable position (OFF), which allows the PRIB to synchronize its timing off of the backplane (from the T1 clocking). If the T1 is a point-to-point T1, set the PRIB in the enable position (ON), the T1 in the disable position (OFF), and do not install the clock cable.

(1) PRIB and (1) BRIB



Install with the cable and set both PRIB and BRIB switches to the enable position (ON).

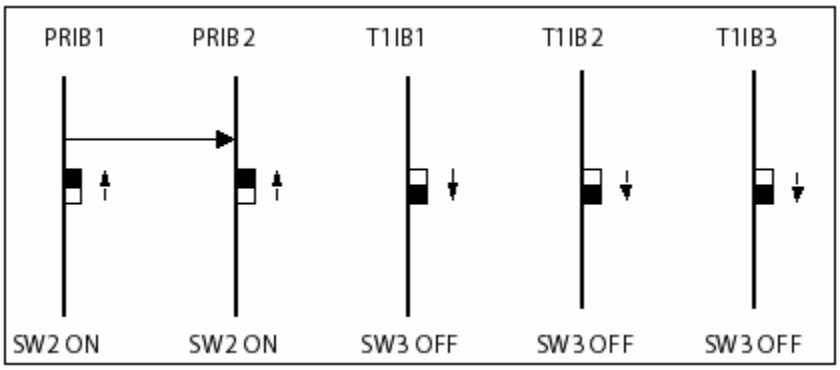
(1) T1IB and (1) BRIB



If both cards in a phone switch are connected to a telephone company clock (not point-to-point T1), put the T1 clock switch in the enable position (ON) to allow it to receive clocking from the telephone company directly. Do not install the clock cable.

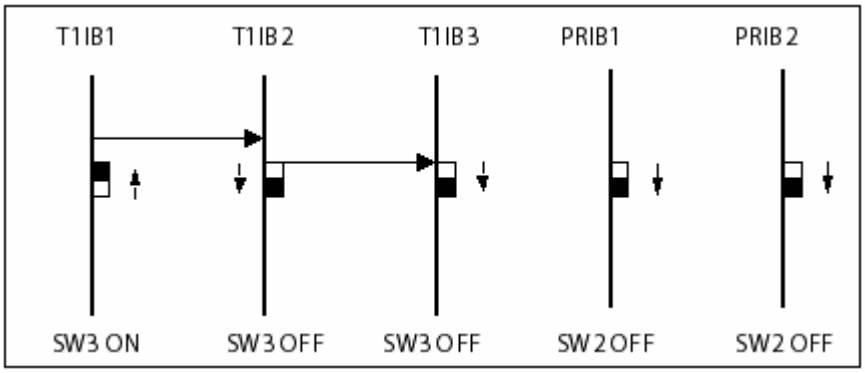
Set the BRIB clock switch in the disable position (OFF), which allows the BRIB to synchronize its timing off of the backplane (from the T1 clocking). If the T1 is a point-to-point T1, set the BRIB to the enable position (ON), the T1 in the disable position (OFF), and do not install the clock table.

(2) PRIBs and (3) T1IBs



The clock cable should be connected to the OUT position on the connector on the PRIB1. The clock cable should be connected to the IN position on PRIB2. SW2 of the PRIB1 and PRIB2 should be placed in the ON position. The three T1IBs are not connected with the clock control cable and SW3 on these boards should be in the OFF position.

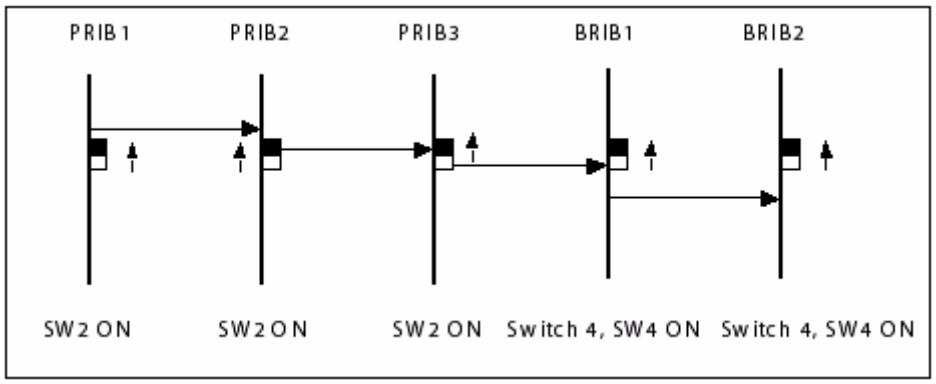
(3) T1IBs and (2) PRIBs



The clock cable should be connected to the OUT position on the cable connector on the T1IB and connected to the IN position on the connector on the T1IB2.

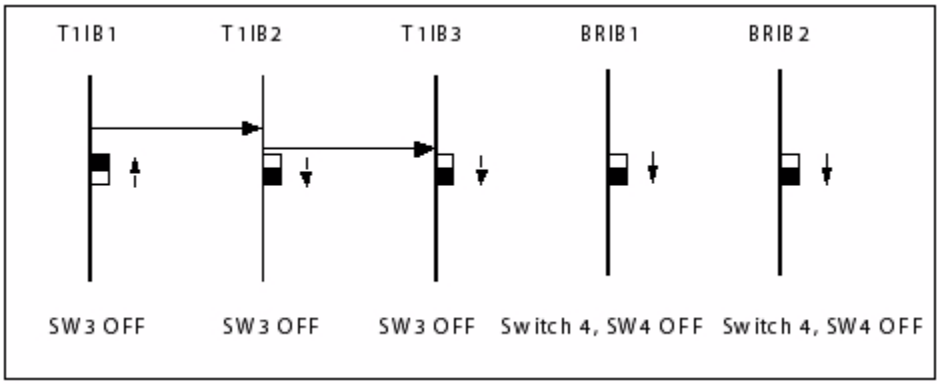
The clock cable should be connected to the OUT position on T1IB2 and connected to the IN position on the T1IB3. SW3 of T1IB1 should be placed in the ON position, with SW3 on T1IB2 and T1IB3 being OFF. The two PRIBs are not connected with clock control cables, and SW2 on the PRIBs should be in the OFF position.

(3) PRIBs and (2) BRIBs



The clock cable should be connected from the OUT position of the PRIB1 to the IN connectors of all the cards and all clock switches should be in the ON position.

(3) T1IBs and (2) BRIBs



The clock OUT cable from T1IB1 should be connected to the clock IN cable of the T1IB2 and the clock OUT cable from T1IB2 should be connected to the clock IN cable of T1IB3. SW3 of T1IB1 should be in the ON position, and SW3 of T1IB2 and T1IB3 should be in the OFF position. The two BRIBs are not connected with clock control cables and the clock switch of the BRIB cards are placed in the OFF position.

Clock Chain Using T1 / PRIB / BRIB

The following four illustrations are clock chain examples that apply to PRIB or T1 use. Arrows on the illustrations represent data flow. The BRIB clock chain is similar, in that you always connect:

- IN of LMU1 to OUT of the BRIB closest to the LMU1
- OUT of a BRIB in Cabinet 1 to the IN of next closest BRIB
- IN of LMU2 to OUT of the BRIB closest to the LMU2
- IN from a BRIB in Cabinets 1 or 2 to the next closest BRIB
- IN from the last BRIB to OUT of LMU2.

The callout of *Figure 3-26: Case 1 of Clock Chain*, that pertains to setting the Clock Source Switch to either PRI/BRI or T1, is applicable to all examples.

The expanded view callout at the top right of *Figure 3-28: Case 3 of Clock Chain* shows the connectors on LMU2 when there is a T1 or ISDN card in the associated Cabinet. The expanded view callout at the middle right of the same illustration shows the connection required for Cabinets 1 or 2 when the Cabinet(s) do not have T1 or ISDN cards in use.

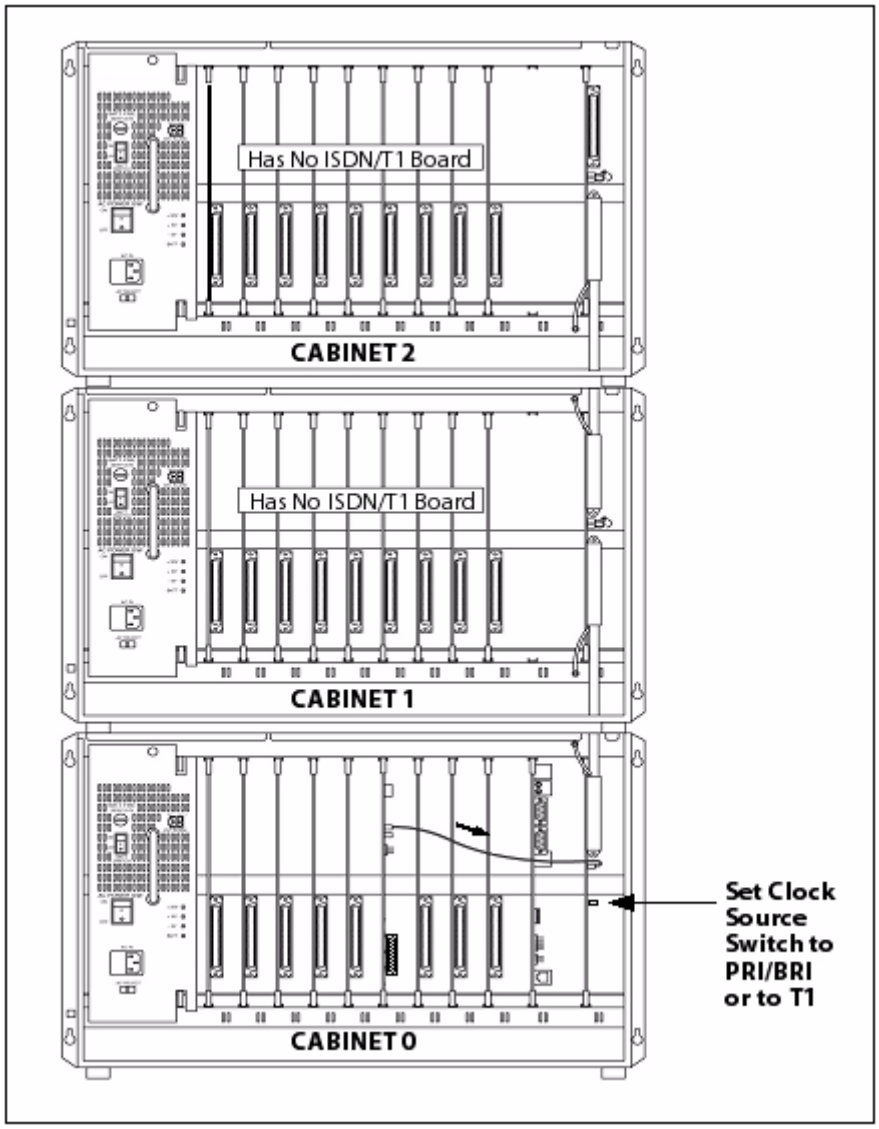


Figure 3-26: Case 1 of Clock Chain

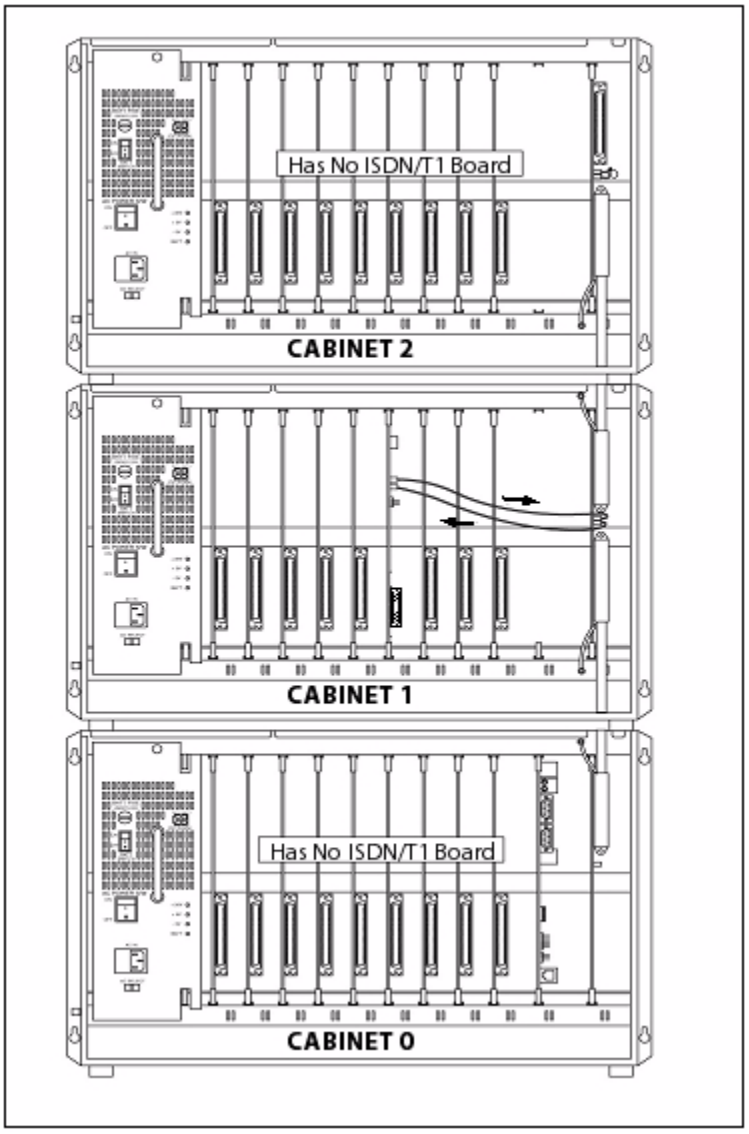


Figure 3-27: Case 2 of Clock Chain

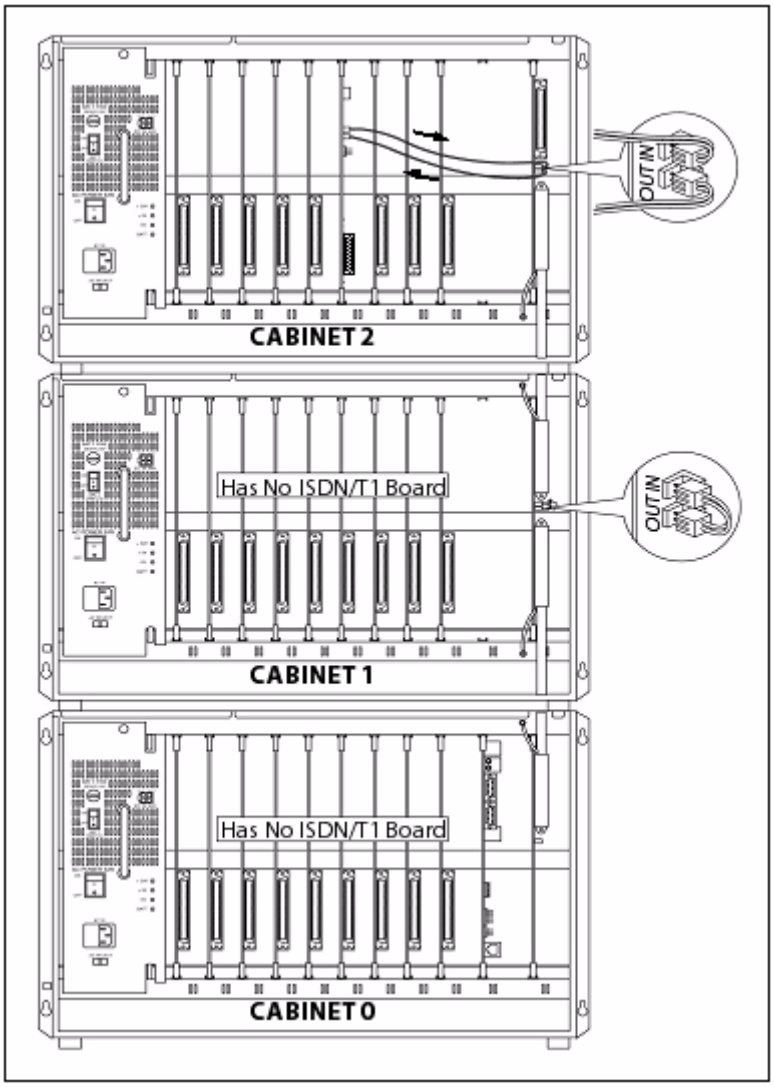


Figure 3-28: Case 3 of Clock Chain

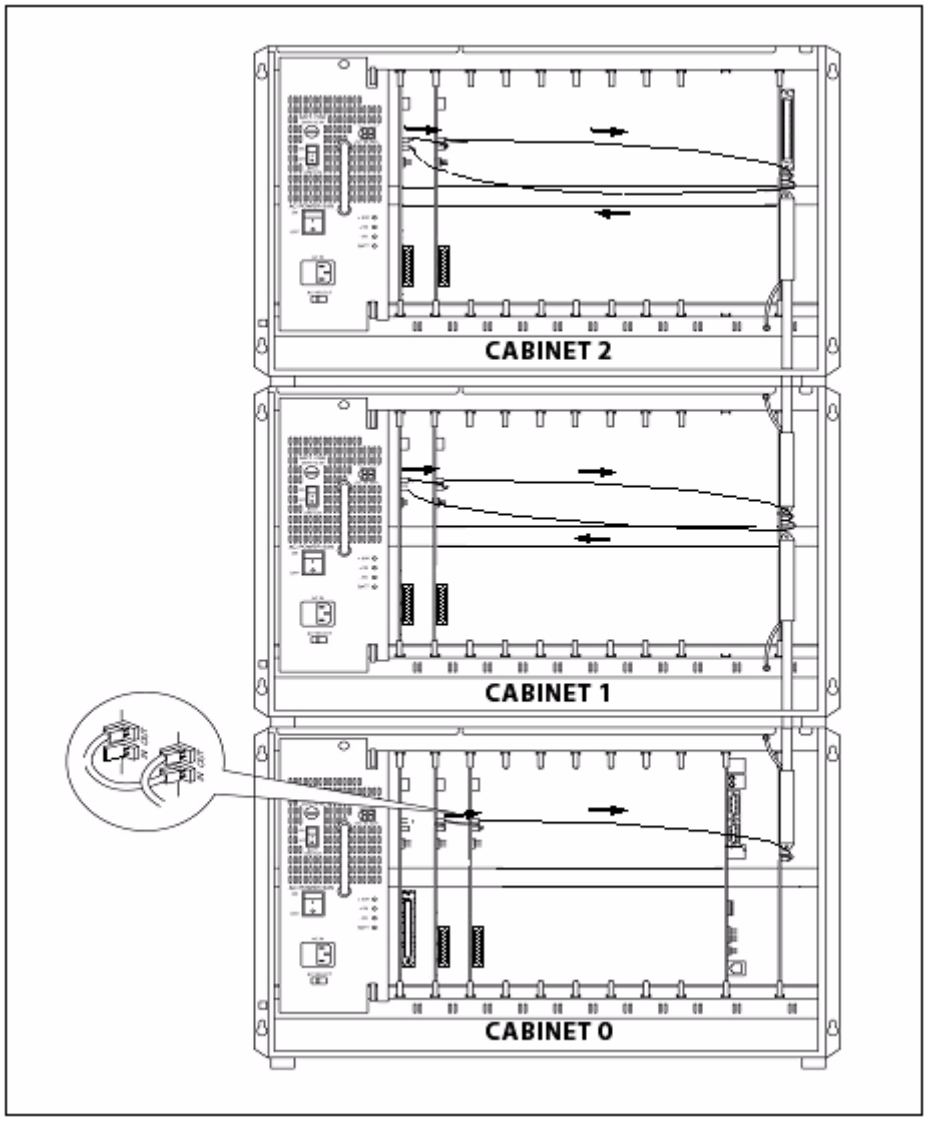


Figure 3-29: Case 4 of Clock Chain

Station Connections

The system can be equipped with any combination of the five station boards; DTIB12, DTIB24, ETIB, SLIBE, and SLIBC. The station interface boards can be installed in any universal card slot in the Cabinets. It is recommended that slots beginning from slot 0 be used for station interface boards. Also, since the first port of the DTIB is the database access port (the only port which enables admin programming by default), it is strongly recommended that a DTIB12 or DTIB24 be installed in slot 0 and a Digital Keyset w/LCD be connected to the first port.

Electronic Telephone Interface Board

The Electronic Telephone Interface Board (ETIB) board provides the interface to twelve electronic telephones or DSS/BLF terminals. The card has one LED indicator for off-hook/in use status. The ETIB card ejectors are color coded green.

There is one 50-pin female amphenol connectors labeled Conn2 located on the front of the card. This allows the system to be cabled to the main distribution frame (MDF). 25-pair telephone cabling must be prepared with mating connectors to extend the interface circuits to the MDF. The cables should be routed through the cable clamps at the bottom of the KSU to the MDF. These cables are then terminated on industry-standard 66M1-50 type punchdown connector blocks. It is recommended that 66M1-50 split blocks with bridging clips be used to simplify troubleshooting and to quickly isolate faults.

Note	*The only telephone that can be used for database programming is the digital Executive display telephone.*

Table 3-18: ETIB Wiring

Pair	PIN #	Color	Description	
1	26 1	WH/BL BL/WH	VT-1 VR-1	CKT1
2	27 2	WH/OR OR/WH	DT-1 DR-1	
3	28 3	WH/GN GN/WH	VT-2 VR-2	CKT2
4	29 4	WH/BN BN/WH	DT-2 DR-2	
5	30 5	WH/SL SL/WH	VT-3 VR-3	CKT3
6	31 6	RD/BL BL/RD	DT-3 DR-3	
7	32 7	RD/OR OR/RD	VT-4 VR-4	CKT4
8	33 8	RD/GN GN/RD	DT-4 DR-4	
9	34 9	RD/BN BN/RD	VT-5 VR-5	CKT5
10	35 10	RD/SL SL/RD	DT-5 DR-5	
11	36 11	BK/BL BL/BK	VT-6 VR-6	CKT6
12	37 12	BK/OR OR/BK	DT-6 DR-6	

Pair	PIN #	Color	Description	
13	38 13	BK/GN GN/BK	VT-7 VR-7	CKT7
14	39 14	BK/BN BN/BK	DT-7 DR-7	
15	40 15	BK/SL SL/BK	VT-8 VR-8	CKT8
16	41 16	YL/BL BL/YL	DT-8 DR-8	
17	42 17	YL/OR OR/YL	VT-9 VR-9	CKT9
18	43 18	YL/GN GN/YL	DT-9 DR-9	
19	44 19	YL/BN BN/YL	VT-10 VR-10	CKT10
20	45 20	YL/SL SL/YL	DT-10 DR-10	
21	46 21	VI/BL BL/VI	VT-11 VR-11	CKT11
22	47 22	VI/OR OR/VI	DT-11 DR-11	
23	48 23	VI/GN GN/VI	VT-12 VR-12	CKT12
24	49 24	VI/BN BN/VI	DT-12 DR-12	
25	50 25	VI/SL SL/VI		

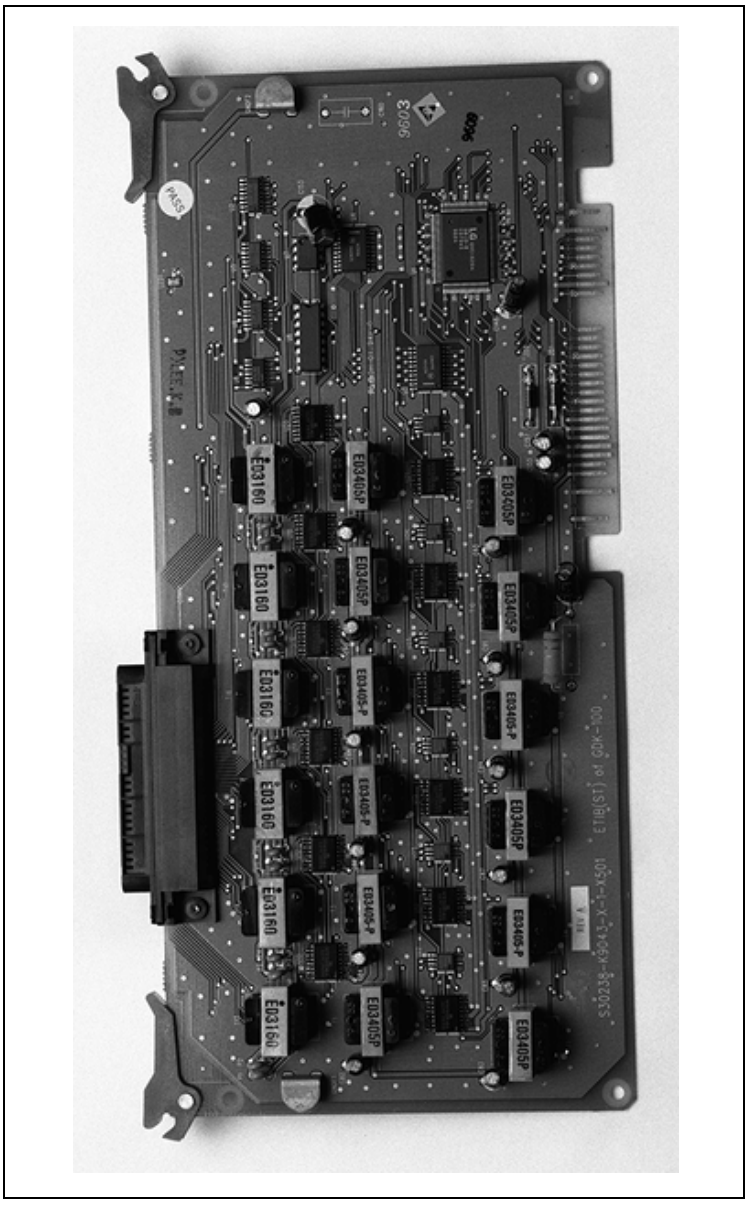


Figure 3-30: Electronic Telephone Interface Board (ETIB)

Single Line Interface Board

The single line interface board (SLIBE and SLIBC) provide the interface to twelve 2500-type telephones. The SLIB signals interface with industry-standard ringers and message waiting lights.

An industry standard RJ21-type female connector is mounted on the front edge of the PCB for connection to the station interfaces. In addition, one LED is mounted on the PCB to indicate the in use state of the connected telephones. It will turn on when one or more ports are busy.

The SLIBE can support a DTRU4 board (4 DTMF receivers). The SLIBC has built-in DTMF receiver capability for all SLIBC circuits (this DTMF receiver capability cannot be used as a shared system resource; the capability only applies to SLIBC circuits). The SLIBE and SLIBC can support two MSGU boards in a daughter board type arrangement.

Table 3-19: SLIBE & SLIBC Wiring

Pair	PIN #	Color	Description	
1	26 1	WH/BL BL/WH	Ring 1 Tip 1	SLIBE & SLIBC Station Ports
2	27 2	WH/OR OR/WH	Ring 2 Tip 2	
3	28 3	WH/GN GN/WH	Ring 3 Tip 3	
4	29 4	WH/BN BN/WH	Ring 4 Tip 4	
5	30 5	WH/SL SL/WH	Ring 5 Tip 5	
6	31 6	RD/BL BL/RD	Ring 6 Tip 6	
7	32 7	RD/OR OR/RD	Ring 7 Tip 7	
8	33 8	RD/GN GN/RD	Ring 8 Tip 8	
9	34 9	RD/BN BN/RD	Ring 9 Tip 9	
10	35 10	RD/SL SL/RD	Ring 10 Tip 10	
11	36 11	BK/BL BL/BK	Ring 11 Tip 11	
12	37 12	BK/OR OR/BK	Ring 12 Tip 12	

Pair	PIN #	Color	Description	
13	38 13	BK/GN GN/BK		
14	39 14	BK/BN BN/BK		
15	40 15	BK/SL SL/BK		
16	41 16	YL/BL BL/YL		
17	42 17	YL/OR OR/YL		
18	43 18	YL/GN GN/YL		
19	44 19	YL/BN BN/YL		
20	45 20	YL/SL SL/YL		
21	46 21	VI/BL BL/VI		
22	47 22	VI/OR OR/VI		
23	48 23	VI/GN GN/VI		
24	49 24	VI/BN BN/VI		
25	50 25	VI/SL SL/VI		

Installing the DTRU4 Module

DTRU4 to SLIBE

1. Unpack the DTRU module from its antistatic conductive bag.
2. Locate the CN1 and CN2 connectors on the DTRU4 module.
3. Locate the CN1 and CN2 connectors on the SLIBE.
4. Position the DTRU4 module so that its CON1 aligns with the CN1 connector and its CON2 aligns with the CN2 connector on the SLIBE.
5. Push the DTRU4 module onto these connectors to seat it securely.

Installing the MSGU48 Board

The Message Wait Lamp Relay Control (MSGU48) provides Message Wait Lamp Relay Control for message lamp single line telephones. The MSGU48 board mounts on the SLIB as a daughter board type arrangement.

MSGU48 to SLIBE or SLIBC

1. Unpack the MSGU48 module from its antistatic conductive bag.
2. Locate the CONN1 and CONN2 connectors on the MSGU48 module.
3. Locate the CN6 and CN7 and the CN5 and CN8 connectors on the SLIBE or SLIBC. Either pair can be used to mount an MSGU48. Use the second pair to mount a second MSGU48.
4. Position the MSGU48 module so that either its:

   CONN1 aligns with CN6 and its CONN2 aligns with the CN7 connector on the SLIBE or SLIBC.

   -or-

   CONN1 aligns with CN5 and its CONN2 aligns with the CN8 connector on the SLIBE or SLIBC.
5. Push the MSGU48 module onto these connectors to seat it securely.

Adjusting Modem Settings

When using modems connected to SLT ports on the *XTS-IP*, the gain settings on the SLT port when using T1 as access to the CO should be set to 0 dB (maximizes modem speed).

CO to SLT Call via a T1 TIE Trunk:

1. Access the specific trunk type above.
2. Hookflash, dial 638 8 on the keypad, then hookflash again.
3. Hang up.

CO to SLT Call via a T1 Trunk:

1. Access the specific trunk type above.
2. Hookflash, dial 638 6 on the keypad, then hookflash again.
3. Hang up.

SLT to SLT Call:

1. Place an intercom call from 1 SLT to another.
2. Hookflash, dial 638 5 on the keypad, then hookflash again.
3. Hang up.

No adjustment is needed if access to the CO is accomplished by standard loop/ground start trunk circuits. These trunk types are set to 0 dB by default.

In all cases the maximum modem speed is not as much as if the modem were connected directly to the CO line.

Testing proves that a baud rate of 33600 can be achieved with SLT-T1 lines. Typical connection speeds with SLT-T1 are 22700-33600. Typical connection speeds with SLT-Loop/ Ground Start are 17400-23800.

Note	*All results were obtained using a 56K U.S. Robotics Sportster modem.*

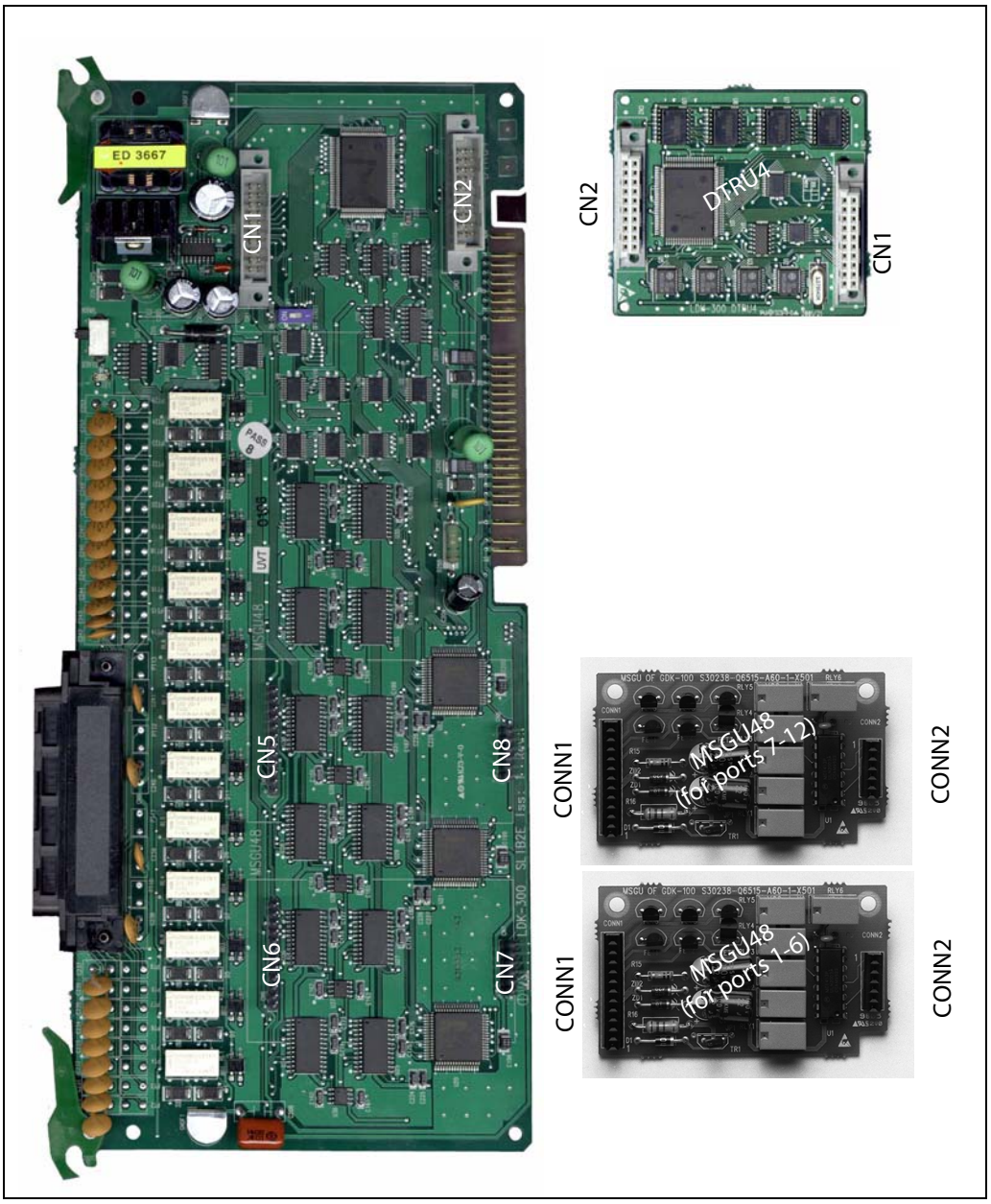


Figure 3-31: SLIBE & SLIBC w/MSGU and DTRU4 Module (SLIBE only) Installation

Digital Telephone Interface Board

The Digital Telephone Interface Board (DTIB) provides digital voice and data communications to/from digital telephones.

An industry standard RJ21 type female connector is mounted on the front edge of the PCB for connection to the station interfaces.

The DTIB12 and DTIB24 boards provide the interface to 12 and 24 digital telephones respectively. The card has one LED to indicate off-hook/in use status. The DTIB card ejectors are color coded green.

Cables

There is one 50-pin female amphenol connector labeled CN2 located on the front of the card. This allows the system to be cabled to the main distribution frame (MDF).

- 25-pair telephone cabling must be prepared with mating connectors to extend the interface circuits to the MDF.
- Cables should be routed through the cable clamps at the bottom of the KSU to the MDF. These cables are then terminated on industry-standard 66M1-50 type punchdown connector blocks.
- It is recommended that 66M1-50 split blocks with bridging clips be used to simplify troubleshooting and to quickly isolate faults.
- LED1 shows status of the board (ON = in use, OFF = Idle).

Table 3-20: DTIB Wiring

Pair	PIN #	Color	Description	
1	26 1	WH/BL BL/WH	DATA-R 1 DATA-T 1	DTIB12 Station Ports
2	27 2	WH/OR OR/WH	DATA-R 2 DATA-T 2	
3	28 3	WH/GN GN/WH	DATA-R 3 DATA-T 3	
4	29 4	WH/BN BN/WH	DATA-R 4 DATA-T 4	
5	30 5	WH/SL SL/WH	DATA-R 5 DATA-T 5	
6	31 6	RD/BL BL/RD	DATA-R 6 DATA-T 6	
7	32 7	RD/OR OR/RD	DATA-R 7 DATA-T 7	
8	33 8	RD/GN GN/RD	DATA-R 8 DATA-T 8	
9	34 9	RD/BN BN/RD	DATA-R 9 DATA-T 9	
10	35 10	RD/SL SL/RD	DATA-R 10 DATA-T 10	
11	36 11	BK/BL BL/BK	DATA-R 11 DATA-T 11	
12	37 12	BK/OR OR/BK	DATA-R 12 DATA-T 12	

Pair	PIN #	Color	Description	
13	38 13	BK/GN GN/BK	DATA-R 13 DATA-T 13	DTIB24 Station Ports
14	39 14	BK/BN BN/BK	DATA-R 14 DATA-T 14	
15	40 15	BK/SL SL/BK	DATA-R 15 DATA-T 15	
16	41 16	YL/BL BL/YL	DATA-R 16 DATA-T 16	
17	42 17	YL/OR OR/YL	DATA-R 17 DATA-T 17	
18	43 18	YL/GN GN/YL	DATA-R 18 DATA-T 18	
19	44 19	YL/BN BN/YL	DATA-R 19 DATA-T 19	
20	45 20	YL/SL SL/YL	DATA-R 20 DATA-T 20	
21	46 21	VI/BL BL/VI	DATA-R 21 DATA-T 21	
22	47 22	VI/OR OR/VI	DATA-R 22 DATA-T 22	
23	48 23	VI/GN GN/VI	DATA-R 23 DATA-T 23	
24	49 24	VI/BN BN/VI	DATA-R 24 DATA-T 24	
25	50 25	VI/SL SL/VI		

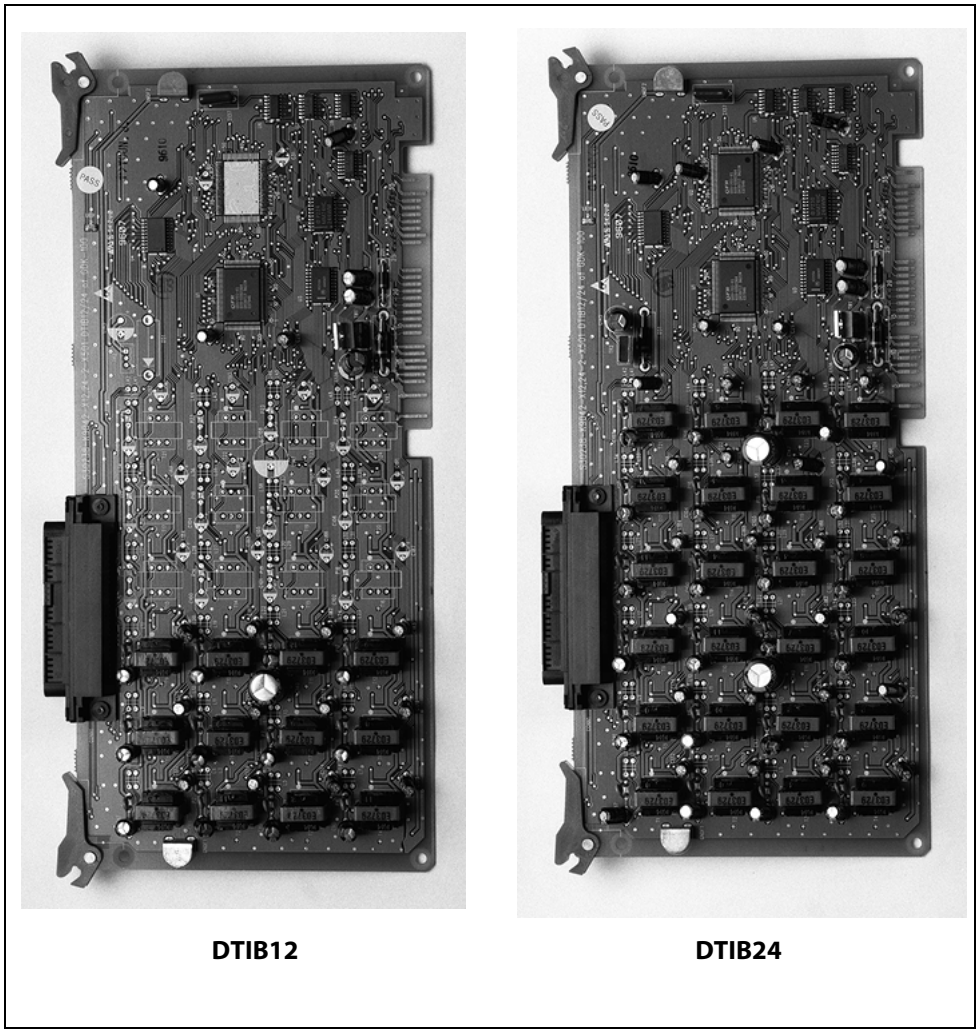


Figure 3-32: Digital Telephone Interface Board (DTIB)

Flash-Based Voice Mail System

This section describes how to install the *Flash-Based Voice Mail* board.

Installing the Voice Mail Interface Board

The *Flash-Based Voice Mail* Card consists of a printed circuit board. It can be installed into slots 1-7 of Cabinet 0, and into slots 0-7 of Cabinets 1 and 2.

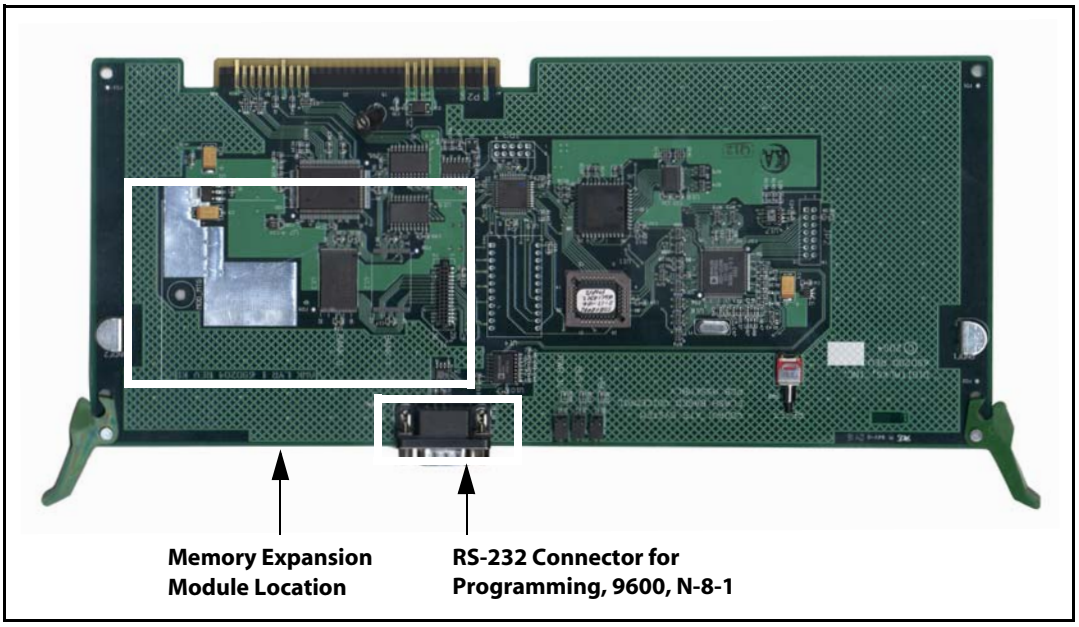


Figure 3-33: Flash-Based Voice Mail Card

Installing the Memory Expansion Module

Refer to *Figure 3-33: Flash-Based Voice Mail Card* to locate the proper placement for the optional memory expansion module.

Note	*You must power down the system before installing the memory expansion module.*

Hard Drive-Based Voice Mail System

Installing the Hard Drive-Based Voice Mail Card

The *Hard Drive-based Voice Mail* Card consists of a printed circuit board. After powering down the KSU, install the voice mail card into slots 1-7 of cabinet 0, or slots 0-7 of cabinets 1-3.

Equipment Handling -- Take every precaution to prevent static charges and physical strain from being applied to the *Hard Drive-based Voice Mail* card. When connecting this device, power off the KSU and brace the ports as the connector is being inserted.

Before powering up the KSU, make any cable connections to the voice mail card as referenced below.

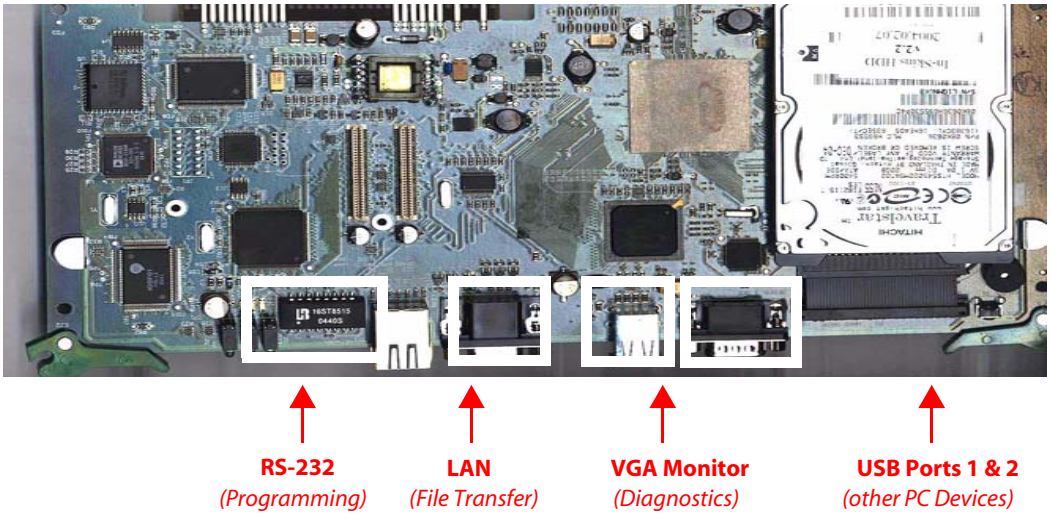


Figure 3-34: Hard Drive-Based Voice Mail Card

System Wiring

Battery Backup Wiring Installation

The system can be equipped to operate from external batteries if local AC power fails. The backup batteries are connected to the strip connector on the front of the PSU as shown:

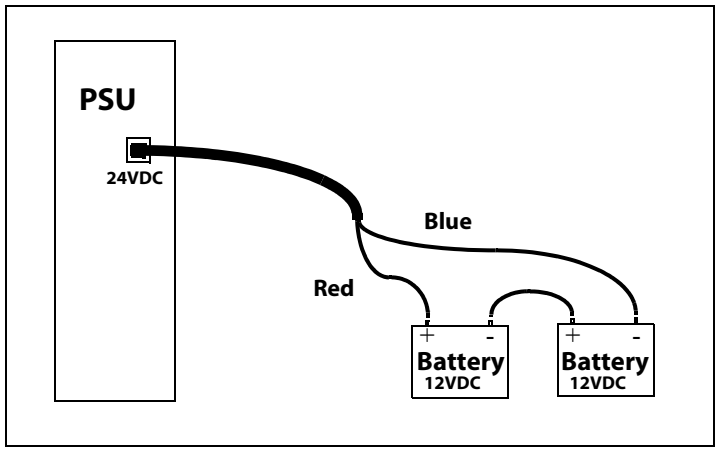


Figure 3-35: Battery Back-Up Wiring

The external batteries must provide 24 Volts DC. This is generally accomplished by connecting two 12-volt batteries per Cabinet in a series arrangement. Operation on batteries is controlled by the PSU. The PSU provides charging current to the batteries during normal AC power operation at a maximum of about 1 amp. After connecting the batteries for backup, ensure that you turn the BATT.SWITCH (located on the faceplate of the PSU) to the ON position so that when AC power fails the batteries will automatically provide power.

During battery operation, the PSU discontinues battery operation if the AC power is reapplied or the battery voltage is too low to maintain proper system operation. If a low-battery cut-off occurs and a new battery must be installed, turn the BATT. SWITCH to the OFF position, replace the battery, then turn the BATT.SWITCH to the ON position.

The length of time the system operates on the batteries is dependent on several elements including: battery charge state, condition of the batteries, capacity of the batteries, and the size of the system (number of station ports).

The following chart gives the approximate backup time for several system sizes and different battery capacities in ampere-hours.

Table 3-21: System BackUp Duration

Ports	Battery Capacity	
	20AH	40AH
32	5.5 Hours	11.0 Hours
64	3.5 Hours	7.0 Hours
96	2.25 Hours	4.5 Hours

RS-232C Wiring on MPB and SIU

The MPB1 contains one and the MPB2/MPBE contains two standard RS-232C interfaces (SMC1 is port 1 on MPB1 and MPB2/MPBE; UART is port 5 on MPB2/MPBE only). The SIU on the MISB contains two standard RS-232C interfaces (port 3 and port 4). The RS-232C is connected by a 9-pin connector.

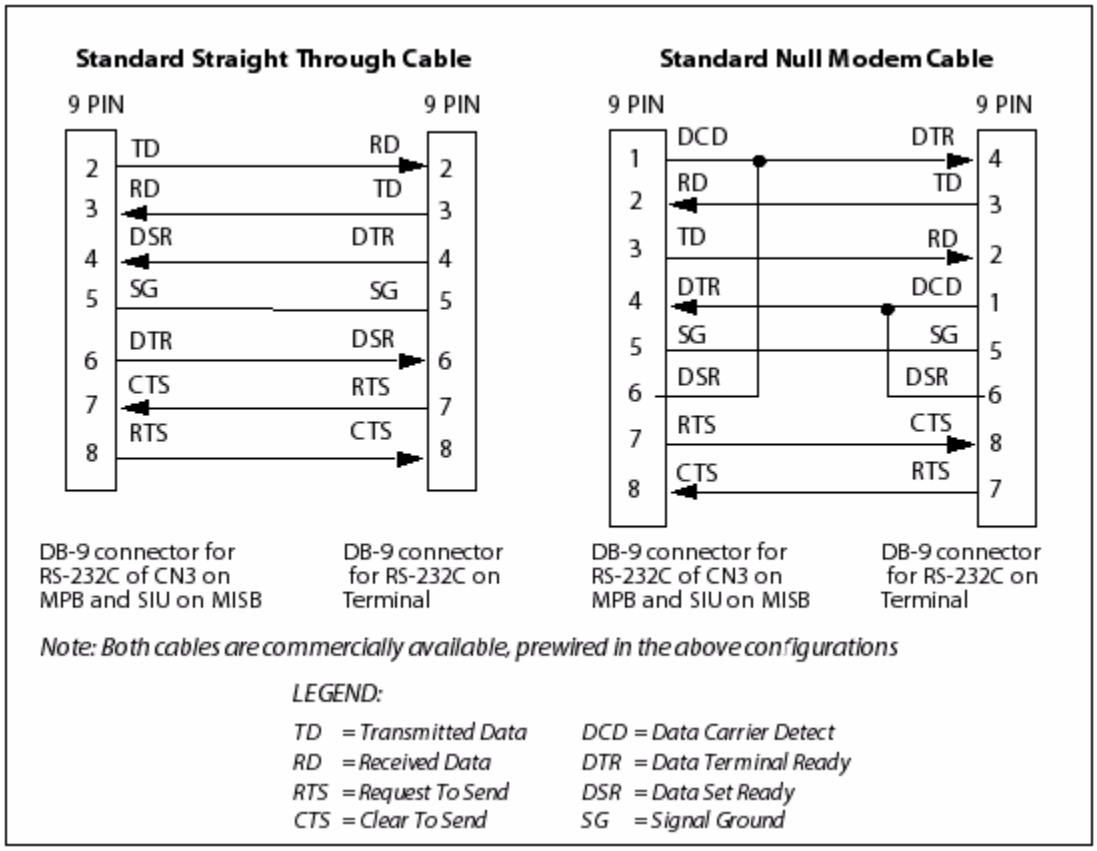


Figure 3-36: RS-232 9-Pin Connector Cable Wiring

Table 3-22: MPB & SIU Communication Ports

Location	Port Number	Port Description	Where it is connected
MPB	1	SMCI	MPB
	2	Modem	MPB
	5	UART	MPB2/MPBE only
SIU	3	RS-232	MISB
	4	RS-232	MISB

MISB Wiring

The MISB has connections for 2 music sources, 2 external page zones and 4 relay contact controls. The MISB connections are made by the 25-pair connector. The wiring connections for the 25-pair cable are identified in Table 3-4 on page 3-23.

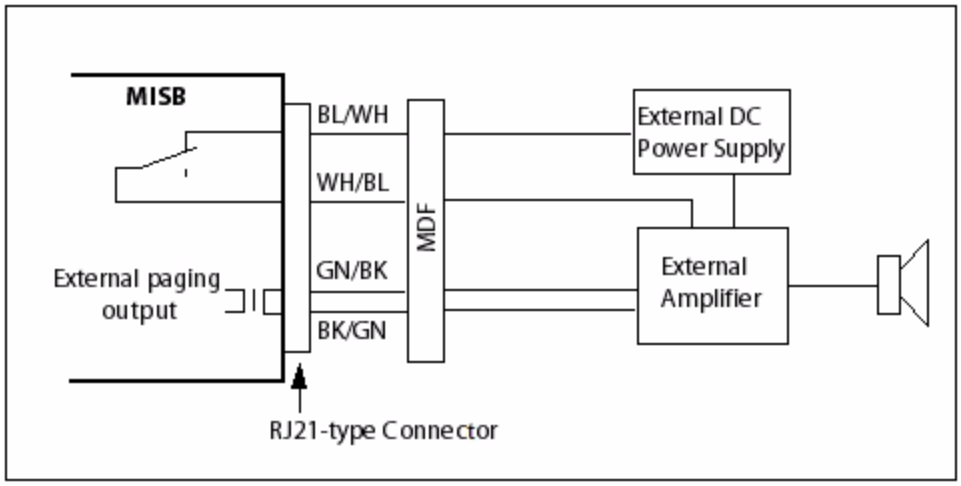


Figure 3-37: External Paging Wiring

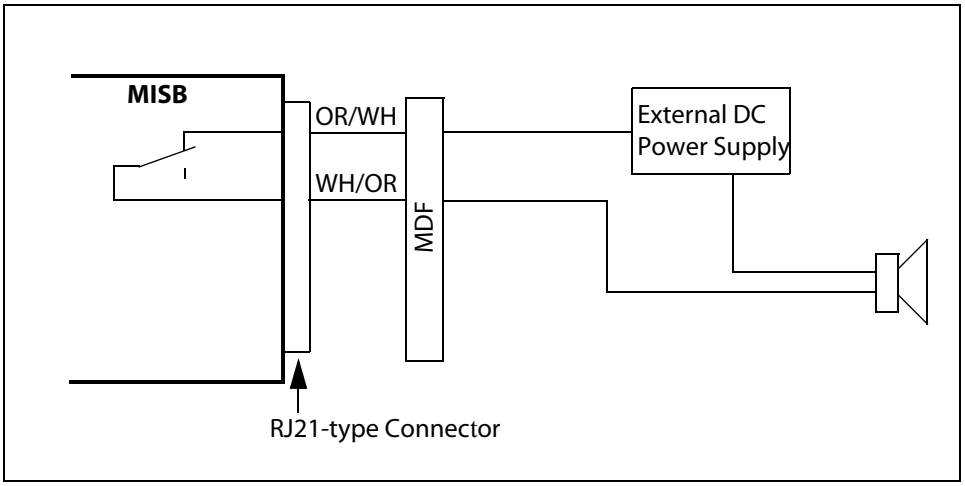


Figure 3-38: Loud Bell Wiring

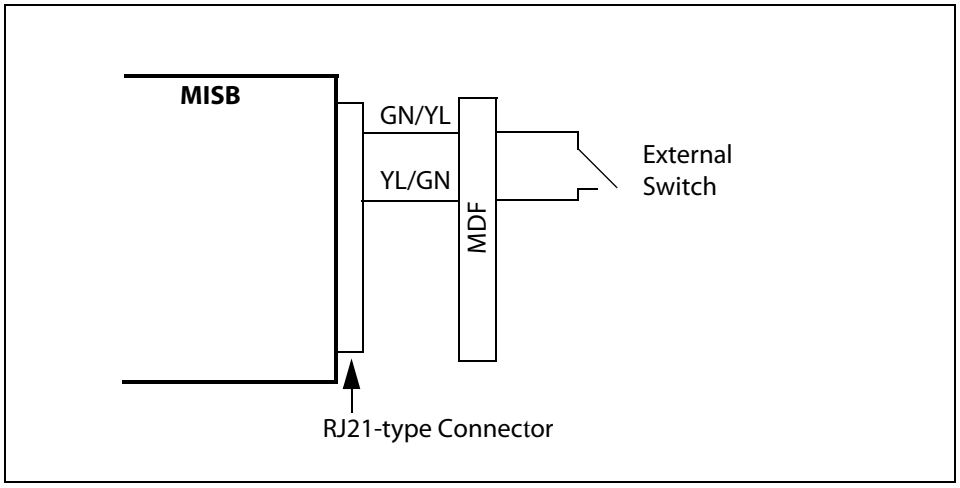


Figure 3-39: External Switch / Alarm Wiring

Station Wiring

Station interface boards (DTIB24, ETIB, SLIBE, SLIBC) include a 25-pair connector for station wiring to the ports on the board. The following provides details on the interconnection of each type of station interface board and the station jack.

Digital Keyset and Terminal Wiring

Wiring from the DTIB to the station jack requires 1-pair wire cabling (category 3 or higher). Wiring from the station jack to the telephone requires 1-pair wire. Digitized voice, signaling and power are sent over this pair.

Figure 3-40 gives details on connections of station jacks to the system and *Table 3-20* gives the configuration of the 25-pair station connector arrangement and punchdown-type block.

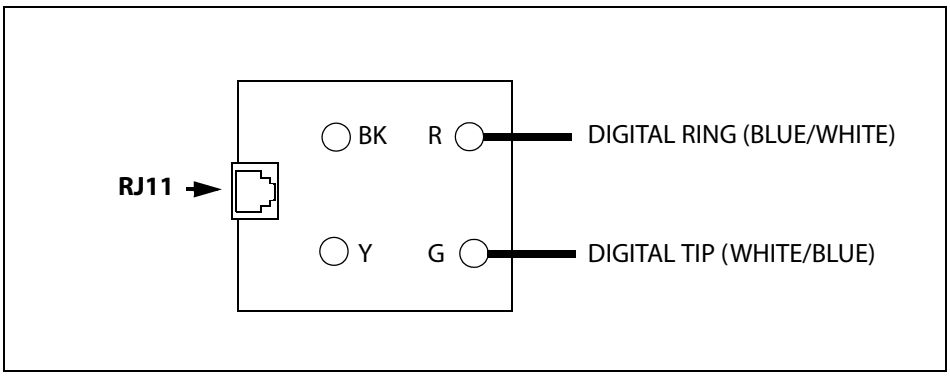


Figure 3-40: Digital Station Jack Wiring

Note	*Only the first pair (Red, Green on jack) should be connected back to the KSU. No other pairs should be connected back to the KSU.*

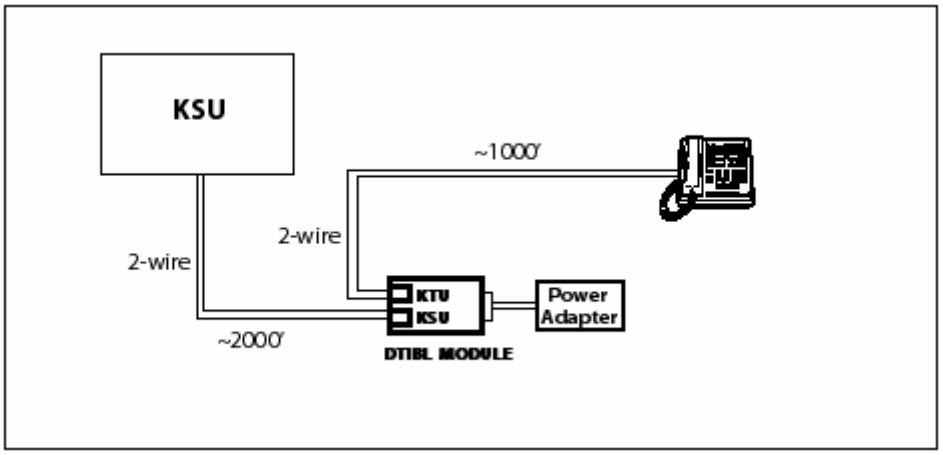
Digital Loop Extender

The Digital Loop Extender (DTIBL) is an optional item that is used to extend the distance that a single digital keyset can be located from the KSU. The maximum recommended loop length of 1000′ from the KSU is extended to approximately 3000′ with the use of the DTIBL.

The distances shown in the following illustration are based on using the full 3000′ of range provided by the DTIBL. The location of an available power source may cause the distances to vary. The distance between the KSU and the DTIBL should always be greater than the distance between the DTIBL and the keyset.

It is recommended that the DTIBL only be used indoors. If out of building use is required, the installer is responsible for providing the necessary surge and environmental protection.

The DTIBL includes a power adapter.



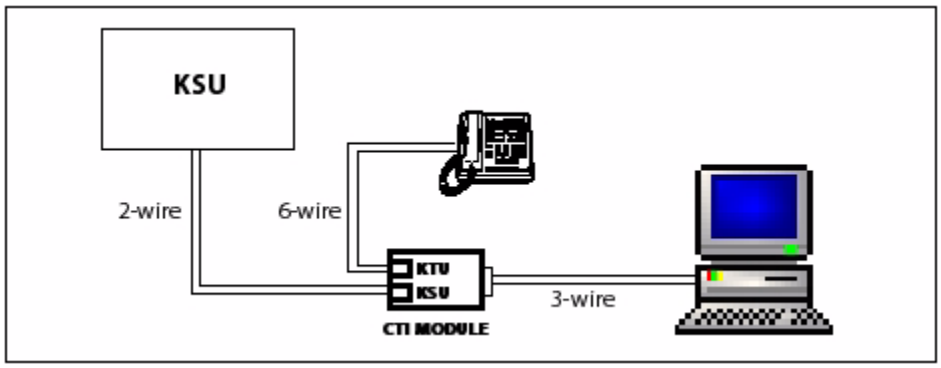
DTIBL Installation Procedure:

1. Connect a 2-wire line cord from the extension block of the KSU to the plug labeled “KSU” on the DTIBL.
2. Connect a 2-wire line cord from the plug labeled “KTU” on the DTIBL to the plug on the base of the keyset.
3. Plug the appropriate cord from the Power Adapter into the DTIBL and the power cord into a power source.

Computer Telephone Integration Module

The Computer Telephone Integration (CTI) module is used to connect the telephone system and a personal computer to facilitate the use of computer-based telephone applications such as *Discovery* Desktop and *Discovery* Link.

The following illustration shows the appropriate connections for installing the CTI module.



CTI Installation Procedure:

1. Connect the 2-wire line cord from the extension block of the KSU to the plug labeled "KSU" on the CTI module.
2. Connect the 6-wire line cord from the plug labeled "KTU" on the CTI module to the plug on the base of the keyset.
3. Connect the 9-pin 3-wire straight-through serial cable from the CTI module to a COM port on the personal computer.

Single Line Adapter

The optional Single Line Adapter (SLA) device converts standard digital telephone circuits into 2500-type single line telephone interfaces. The device is a stand-alone type that can accommodate up to two digital station ports and convert them into two 2500-DTMP-type SLT circuits.

Wiring / Pinouts / Connections -- The SLA has screw-type connectors for both the digital (DTIB) and analog (SLT) interfaces.

Refer to the Single Line Adapter's Installation Guide provided with the SLA unit for additional information.

Figure 3-41: SLA (Single Line Adapter)

Electronic Keyset and Terminal Wiring

Wiring from the ETIB to station jack requires two pairs of wire. The first pair provides the audio or voice path, the second is for signaling or data path. The DATA pair is polarity sensitive. Reversal does not harm the keyset or system, but the port does not function properly when reversed. Power is delivered by applying DC voltage to the center tap of the coupling transformers of each of the 2 pairs.

Figure 3-30 gives details on connections of station jacks to the system and *Table 3-18* gives the configuration of the 25-pair station connector arrangement and punchdown-type block.

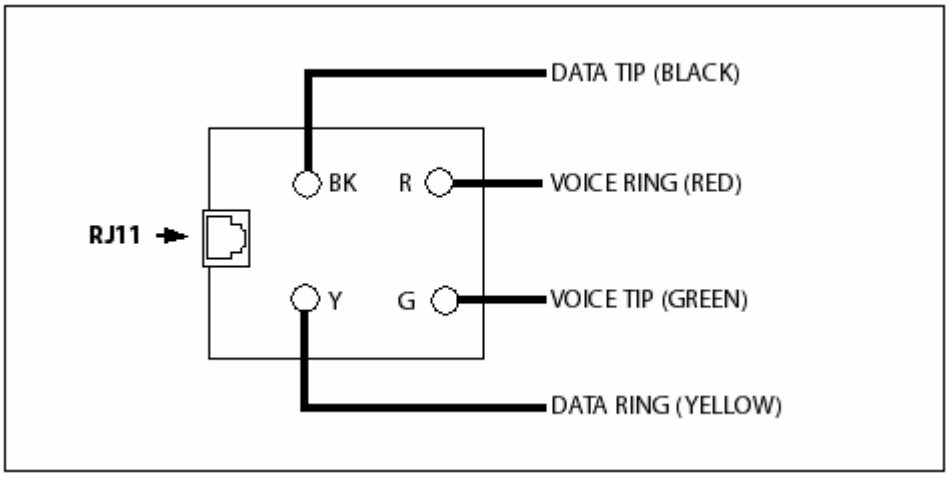


Figure 3-42: Electronic Station Wiring

Single Line Telephone Wiring

The SLIB is wired to SLT devices with a single pair of wire which provides battery feed, voice and signaling to and from the SLT. Typical wiring to the SLT jack is shown in *Figure 3-43* and *Table 3-19* gives the configuration of the station connector arrangement when connected to a punchdown-type block.

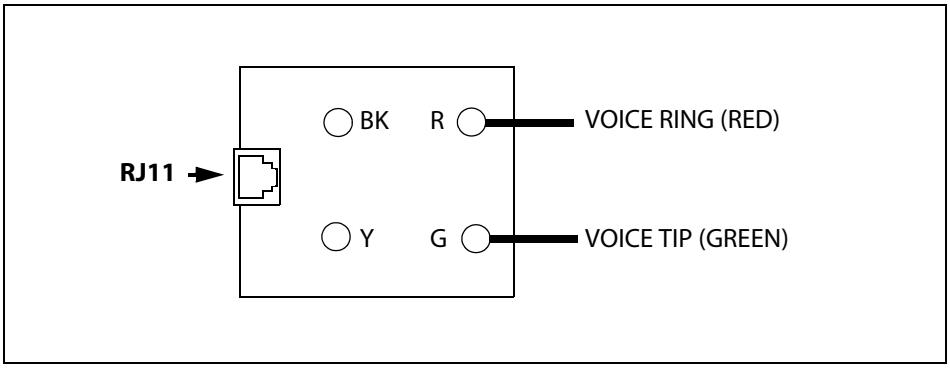


Figure 3-43: Single Line Telephone Wiring

Power Failure Transfer Unit Wiring

The Power Failure Transfer Unit (PFTU) is wired from the 25-pair connector to the MDF, cross connected to the CO Line inputs from the telephone company, to the CO Line inputs of the system, and to Power Failure SLTs.

The diagram in *Figure 3-44* shows the wiring for the first of six circuits wired consecutively on the amphenol cable (It uses the first 4 pairs on the block. The next circuit uses the next 4 pairs, etc.) The relay is a DPDT (Dual Pole Dual Throw). There are a total of 6 relays on the PFTU.

When the power is ON, the relay connects COR1-IN to COR1-OUT and COT1-IN to COR1-OUT.

When the power is OFF, the relay switches so that the relay now connects COR1-IN to TEL1-R and COT1-IN to TEL1-T.

Note	*The SLIBE Subscriber (SLIB1-R and SLIB1-T) is only a connection so that the SLTs can also be used off the SLIB card. There is no relay connection involved with this pair. It is always connected to the SLIB card. When the power is ON, the relay is not connected to the SLIBs. When the power is OFF, the KSU SLIB is not powered up and the SLTs are now connected to the CO lines.*

The basic connections of circuit 1 are shown in *Figure 3-44* and the total connector configuration is given in *Table 3-23*. Note that the SLT may also be connected to a SLIB as shown in the figure.

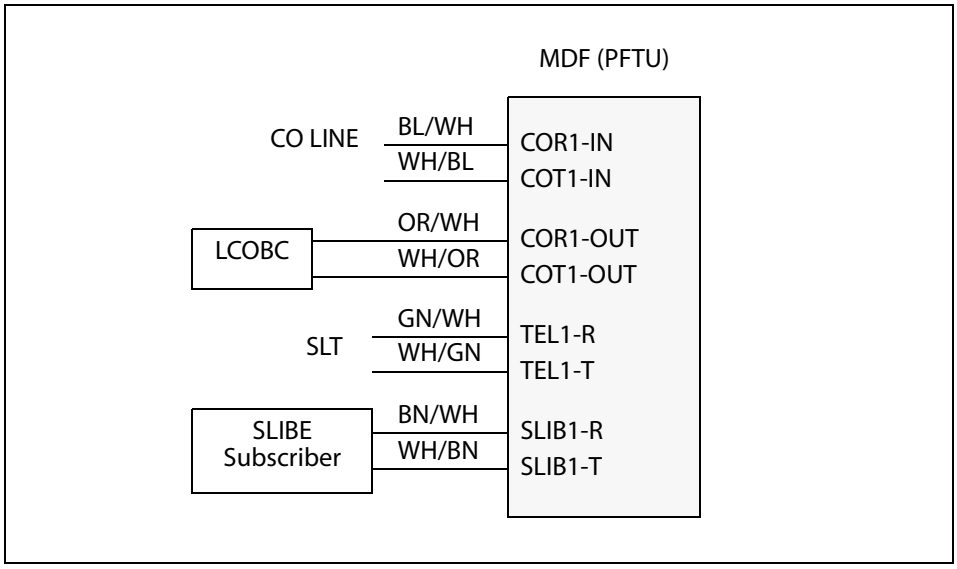


Figure 3-44: PFTU Wiring Example (Circuit 1)

Table 3-23: PFTU Block Wiring

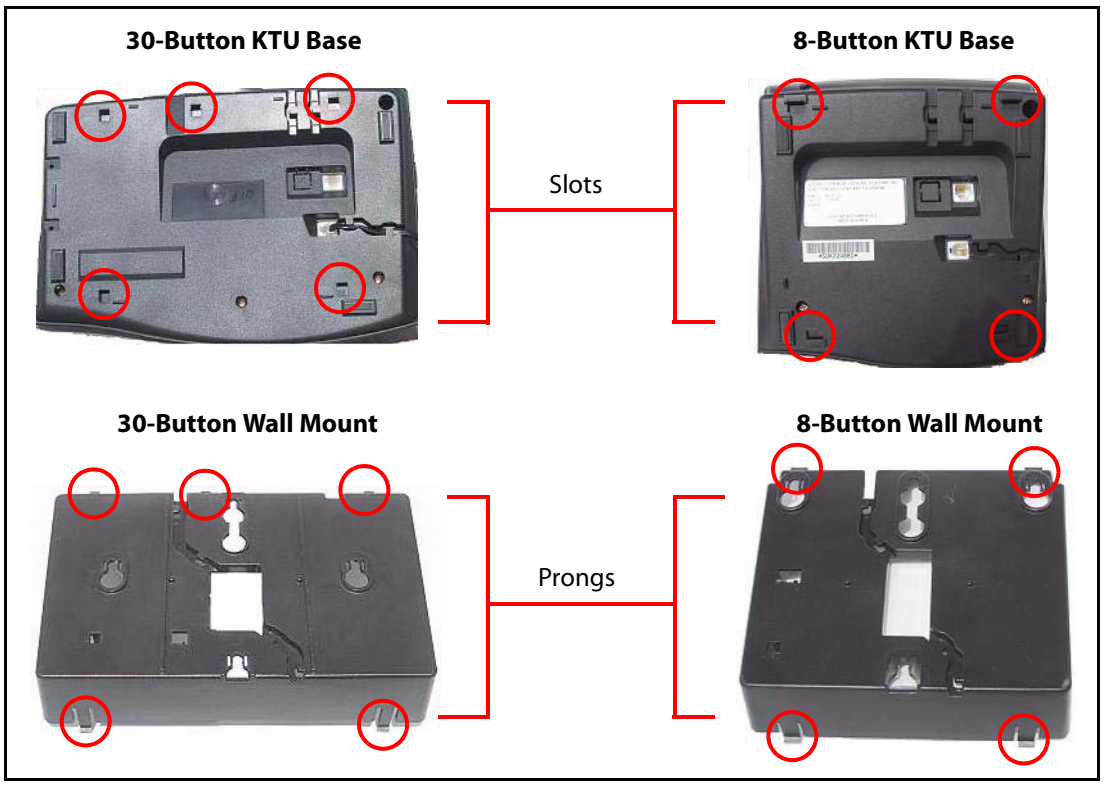
	Pair	PIN #	Color	Description
Circuit 1	1	26 1	WH/BL BL/WH	Ring 1 Tip 1
	2	27 2	WH/OR OR/WH	Ring 2 Tip 2
	3	28 3	WH/GN GN/WH	Ring 3 Tip 3
	4	29 4	WH/BN BN/WH	Ring 4 Tip 4
Circuit 2	5	30 5	WH/SL SL/WH	Ring 5 Tip 5
	6	31 6	RD/BL BL/RD	Ring 6 Tip 6
	7	32 7	RD/OR OR/RD	Ring 7 Tip 7
	8	33 8	RD/GN GN/RD	Ring 8 Tip 8
Circuit 3	9	34 9	RD/BN BN/RD	Ring 9 Tip 9
	10	35 10	RD/SL SL/RD	Ring 10 Tip 10
	11	36 11	BK/BL BL/BK	Ring 11 Tip 11
	12	37 12	BK/OR OR/BK	Ring 12 Tip 12

	Pair	PIN #	Color	Description
Circuit 4	13	38 13	BK/GN GN/BK	
	14	39 14	BK/BN BN/BK	
	15	40 15	BK/SL SL/BK	
	16	41 16	YL/BL BL/YL	
Circuit 5	17	42 17	YL/OR OR/YL	
	18	43 18	YL/GN GN/YL	
	19	44 19	YL/BN BN/YL	
	20	45 20	YL/SL SL/YL	
Circuit 6	21	46 21	VI/BL BL/VI	
	22	47 22	VI/OR OR/VI	
	23	48 23	VI/GN GN/VI	
	24	49 24	VI/BN BN/VI	
	25	50 25	VI/SL SL/VI	Open

Wall Mounting the Digital Key Telephone

To wall mount the 8-button or 30-button digital key telephone, use the appropriate wall mount bracket and a standard-type jack designed for 630-type wall hanging applications.

1. Remove the handset from the cradle and locate the plastic retainer in the bottom of the hookswitch well area.
2. Slowly push the plastic retainer upward until it is free.
3. Locate the tab on the plastic retainer so that it is oriented towards the top of the keyset.
4. Slide the plastic retainer into its channel. Part of the retainer remains above its holder to secure the handset during use in a wall mount configuration.
5. Turn the telephone over and unplug the line cord.
6. Run the line cord through the rectangular hole of the wall mount and plug one end into the connector on the base of the telephone.
7. Align the prongs on the top and bottom of the wall mount bracket so that they can engage with the slots in the bottom of the telephone base. Insert the top prongs first.
8. Press the wall mount bracket slowly upward until the bottom prongs slide into the bottom slots and snap into place.
9. Plug the line cord from the KTU into the connector on the 630-A jack (refer to *Figure 3-45: Electronic Key Telephone Wall Mounting* for an illustration of a 630-A jack).
10. Match the two keyhole slots on the wall mount bracket with the lugs on the 630-A jack, then slide the telephone into place.
11. Place the handset into its cradle.



Wall Mounting the Electronic Key Telephone

All connections to the Electronic Key Telephone are fully modular. To wall mount the Electronic Key Telephone, it is necessary to have one Wall Mount Kit and one standard-type jack assembly designed for normal wall hanging applications.

1. Unplug the line cord from the phone. This line cord is not required and should be retained as a maintenance replacement item.
2. Lift the plastic number retainer upward and expose the screw underneath. Remove the screw and the handset tab. Replace it with the handset tab from the Wall Mount Kit.
3. Be careful to position the tab so that the protrusion faces the hookswitch. This allows the handset to remain secure when the telephone is on the wall. Replace the screw and snap the number retainer into place.
4. Substitute the short modular cord from the Wall Mount Assembly into the modular connector vacated by the line cord.
5. Align the wall mount base plate with holes on the bottom of the phone. Snap in place.
6. Match the two key hole slots on the base plate with the lugs on the 630-A type jack. Align the modular connector and slide telephone into place. Refer to *Figure 3-45*.

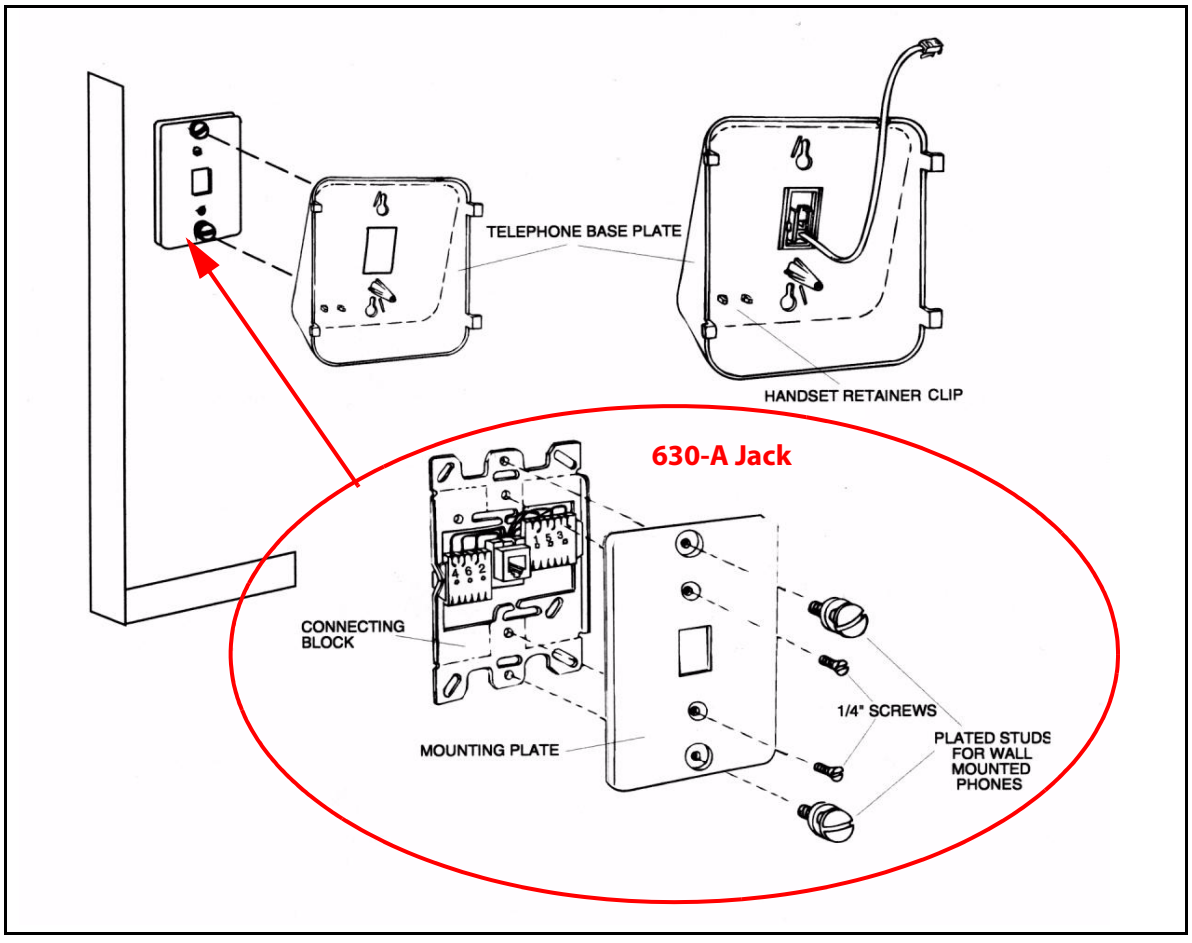


Figure 3-45: Electronic Key Telephone Wall Mounting

Headset Installation

Digital Key Telephones used with the *XTS-IP* have been designed to operate with industry-standard electret-mic-compatible modular headset adapters and operator headsets. The Executive 8-Button Speakerphone (P/N 3012) and the Executive 30-Button Speakerphone (P/N 3015 & 3017) models have a 2.5 mm jack located on the left side of the keyset.

To modify a Digital Key Telephone to support an external headset:

1. Plug the headset adapter cord into the vacant handset jack on the Key Telephone base.
2. Plug the telephone handset cord into the headset adapter box where indicated by the headset manufacturer's instructions.

-or-

Plug the headset cord into the 2.5 mm jack.

The Headset Operation must be enabled (refer to *Handset/Headset Mode* in the Programming and Operations Manual). The station then has the capability to enable/disable headset mode by dialing a code. When Headset mode is active at the station, the ON/OFF button controls the on-hook or off-hook status. Also, features such as on-hook dialing and handsfree speakerphone operation become inoperable.

Caller ID Interface Unit Installation

The Caller Identification Interface Unit receives the data from the telephone company and sends the data, in ASCII RS-232C format to a printer, telephone, computer or DTE (Data Terminal Equipment) device.

Selecting the Cable

1. Select the correct cable for the MPB and SIU.
   - To connect a 1480-00 caller ID box to the SMC1 connector of the MPB or to the SIU, use cable P/N 9081-01.
   - To connect a 7480-00 caller ID box to the SMC1 connector of the MPB or to the SIU, use the flat ribbon cable supplied and the 7481-10 adapter kit.
2. Connect one end of the cable on the desired KSU I/O port (3, 4, or 5).

3. Connect the other end to the OUT port on the Caller ID unit. Use the adapter as necessary.

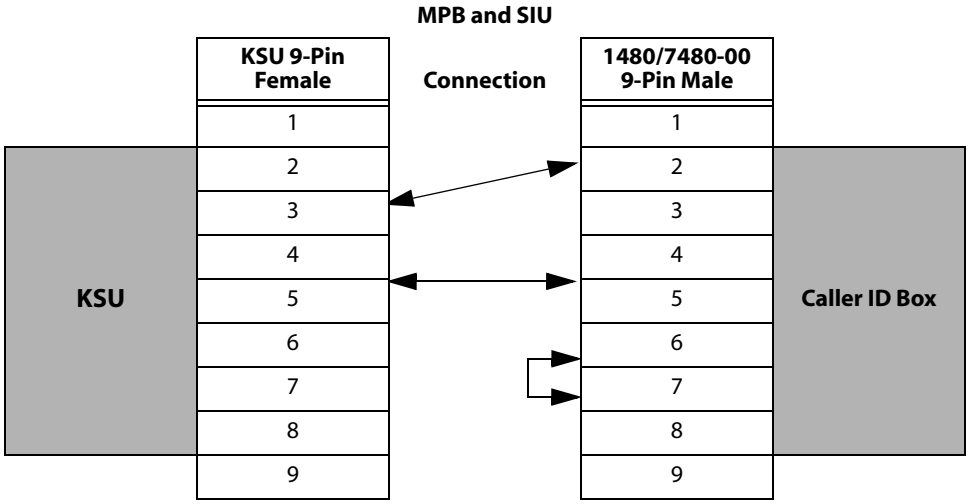
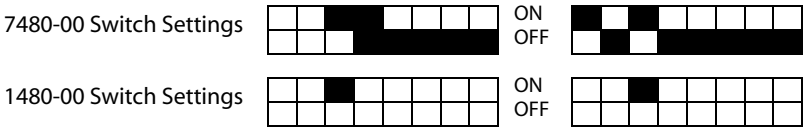


Figure 3-46: 1480 Caller ID Cable Connections



Refer to the 1480 or 7480 Manual to confirm the proper switch settings.

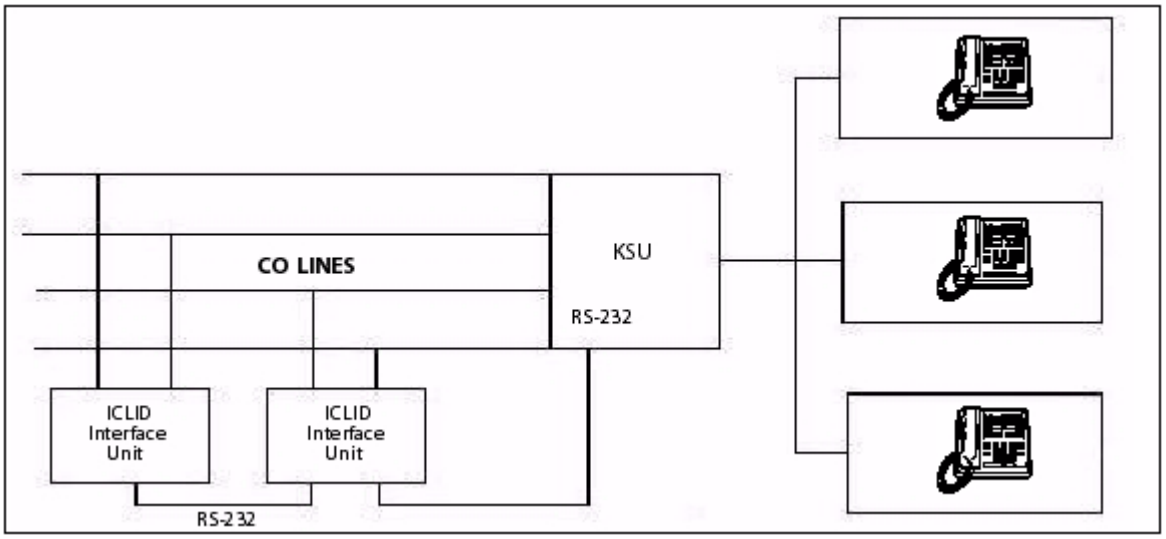


Figure 3-47: Caller ID System Configuration

IP Phones and Related Items

> **Note** *All Vodavi IP phones and IP gateway products require the use of Category 5 cabling as a minimum for patch cables and network runs.*

The IP Keyset is available in the following configurations:

Table 3-24: IP Keyset Models

Model	Description
IP-24DH	IP Phone 24Btn Display w/Switched Hub port
IP7008D	IP Phone 8Btn Display w/Switched Hub port
IP7024D	IP Phone 24Btn Display w/Switched Hub port

LAN Ports

Each IP phone has two LAN ports and thus two RJ-45 connectors. One port is for connecting to the LAN. The other can be connected to the network-ready PC. The ports are connected to an intelligent 10/100Base-T switch, which gives LAN access to the data device while giving priority to voice packets.

Fixed/Flexible Buttons

Each IP Keyset has a standard 12-button dial-pad, handset, an array of "Flexible buttons", and Fixed Feature Access keys. All of the Flexible and Fixed buttons, except the Volume controls, incorporate a long-life, super-bright LED to indicate the circuit or feature status.

Features

The IP Keyset circuitry includes Digital Signal Processing to implement packet voice encoding and decoding, and echo cancellation as well as tone generation and speakerphone operation. The Volume controls, which consist of separate volume up down buttons, adjust the level of the handset as well as the speaker.

The IP Keyset includes a Liquid Crystal Display (LCD). The LCD provides an alphanumeric display to assist the user in operation of features.

> **Note** *The IP Keyset <u>does not</u> support the following features:*
> *OHVO; Background Music; feature code 695 (change ring tones); and receiving pages. (making pages is allowed).*
> *All buttons on the IP Keyset work like other Vodavi keysets, except on the IP-24D/H phone the PGM button is the HPT toggle and the ICM and SAVE buttons are non-functional.*

The IP Keyset is powered locally with a Keyset AC/DC Adapter. If both the AC/DC Adapter and powered LAN port are connected to an IP Keyset, the Adapter will provide the power needed.

Refer to Appendix D of the *XTS-IP* Programming & Operations Manual for instructions on how to configure IP keysets for operation.

IP Keyset Power

The IP phone can be powered by one of two methods.

- IP Keyset AC/DC Adapter (plugs into base of the unit)
- Inline Power Over Ethernet (POE)

IP Keyset AC/DC Adapter

When an IP Keyset is to be powered from local AC (not provided power over the LAN), a separate AC/DC adapter must be used for power. The adapter is supplied with a ten-foot AC cord.

The adapter supports AC input power systems with rated voltage range of 100-240 VAC @ 50/60 Hz. The adapter provides 48 VDC at 0.1 amps. The DC output connector is cabled to the adapter with a ten-foot cable.

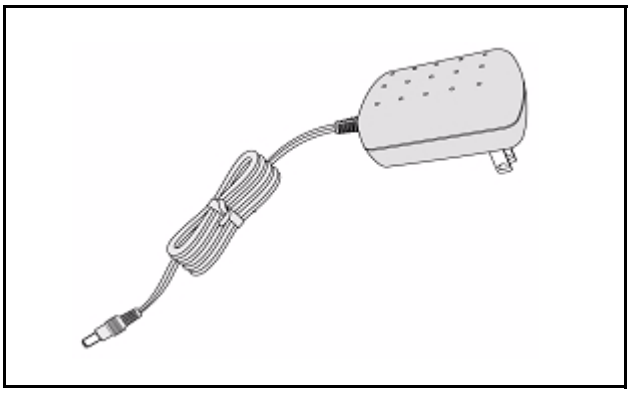
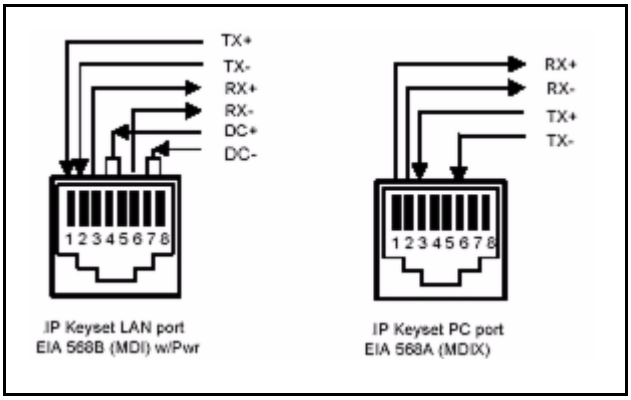


Figure 3-48: AC/DC Adapter for Keyset

Inline Power Over Ethernet

The phone supports Ethernet power in accordance with the 802.3af specification.

The following illustration shows the inline power scheme:



Nomad Remote Services Gateway Module

Modern businesses often have remote office locations consisting of a single employee home office to offices with a number of employees. These remote locations are served by independent telecommunications systems, which do not easily provide continuity of service. Services to the corporate telecomm system are typically via a DISA type facility and the remote user is excluded from services to many of the system's resources and functionality.

While telecomm systems may be networked over PSTN or leased line facilities to provide remote connection, such connections are expensive and do not incorporate protocols to efficiently provide interconnection to a small number of remote users. Nor do these protocols allow for the simple transfer of the detailed information needed between the two end-points necessary to support today's complex communication features.

A major advantage of VoIP in the telecomm market is the ability of the protocol to carry out a transparent remote connection efficiently for even a small number of remote users.

The Nomad Remote Services Gateway Module (*Nomad RSGM*) permits remote users and interfaces with services to the *XTS-IP* System over broadband IP networks. Remote Services are implemented with the *XTS-IP* employing VoIP channels of the VoIP card to communicate with remote keysets and *Nomad RSGM*s. A typical remote configuration is shown in *Figure 3-50*. Note that the *XTS-IP* can service multiple remote keysets and *Nomad RSGM*s simultaneously.

Nomad RSGM hardware resources include:

- One WAN connection port (RJ-45: 10/100 Ethernet port) – Auto MDI, MDIX switching feature
- One PC connection port (RJ-45: 10/100 Ethernet port)
- One IP phone connection port (RJ-45: 10/100 Ethernet port) – Power feeding capable
- One analog CO port (RJ-11)
- One analog SLT port (RJ-11)
- One BGM port
- One Alarm/Doorbell contact
- Two dry relay contacts

The *Nomad RSGM* includes the Ethernet port and MAC for the 10/100 Base-T Ethernet interface as well as packet voice processing functions. The WAN connection Ethernet port has an auto MDI, MDIX switching feature; therefore, both straight cable and cross cable can be used.

IP Addressing Support

The gateway's WAN port can function as a Dynamic Host Configuration Protocol (DHCP) client or can use a manually-assigned IP configuration.

The gateway's LAN side includes a built-in DHCP server, which can provide IP addresses for multiple LAN hosts. The DHCP server is enabled by default, and can be configured by the installer.

Front Panel

The front panel of the *Nomad RSGM* has:

- Power status LED
- RCA jack for external music (audio) source -BGM-
- Eight LEDs
- RJ-45 Female LAN connector with yellow Speed (ON for 100 Base-T) and green Link/Activity LEDs for WAN connection to the router/broadband modem
- RJ-45 Female LAN connector with yellow Speed (ON for 100 Base-T) and green Link/Activity LEDs for PC connection
- RJ-45 Female LAN connector with yellow Speed (ON for 100 Base-T) and green Link/Activity LEDs for IP phone connection
- LED indicator to display IP phone power feeding status

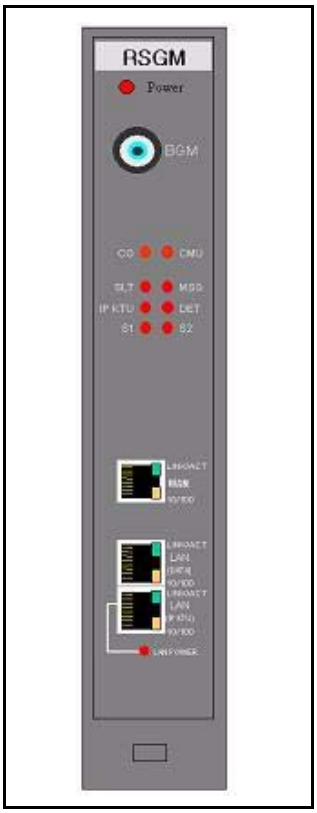


Figure 3-49: Nomad RSGM Front & Rear Panels

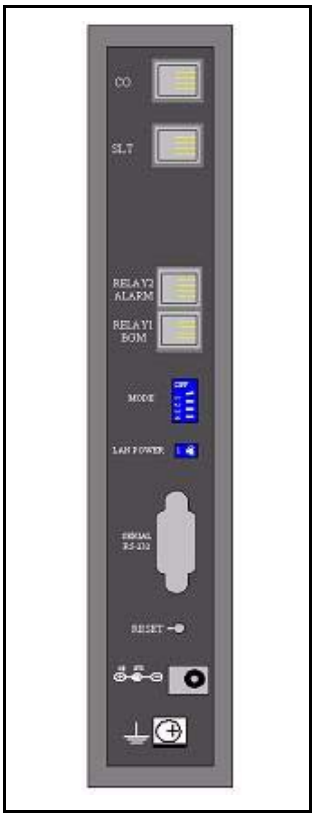
Rear Panel

The rear panel of the *Nomad RSGM* has:

- One RJ-11 female connector for analog CO Line
- One RJ-11 female connector for analog SLT
- One RJ-11 female connector for alarm/door bell input & dry relay contact #2
- One RJ-11 female connector for external BGM and dry relay contact #1
- Four-position DIP-switch for mode selections

  In the case of a WAN disconnect, the IP phone can be used to access a local CO line if the IP phone was connected in the Local Mode. The dip switch settings enable/disable this feature, as well as controlling alarm and relay functions.

  Switch 1: CO Dial Type - Off (DTMF), On (Pulse)
  Switch 2: Alarm Set - Off (not Set), On (Set)
  Switch 3: Relay 1 Set - Off (not set), On (Set)
  Switch 4: Relay 2 Set - Off (not set), On (Set)
- One-position DIP-switch for IP phone power feeding selection
- DB-9 RS-232 connector
- Reset Switch
- Power jack for the AC/DC adapter supplied with the *Nomad RSGM*
- Ground Lug



Basic Setup Instructions

Make the following connections in the order listed from top to bottom.

Port Markings	Connect This Device
WAN	Internet DSL/Cable modem/router via CAT5 straight-through cable
48V	Supplied AC power adapter
LAN (IP KTU)	Vodavi IP phone via CAT5 straight-through cable. Place the switch marked "LAN Power" to the ON position.
SLT	Single line telephone (optional)
CO	Local analog PSTN line (not used with *XTS-IP* systems)

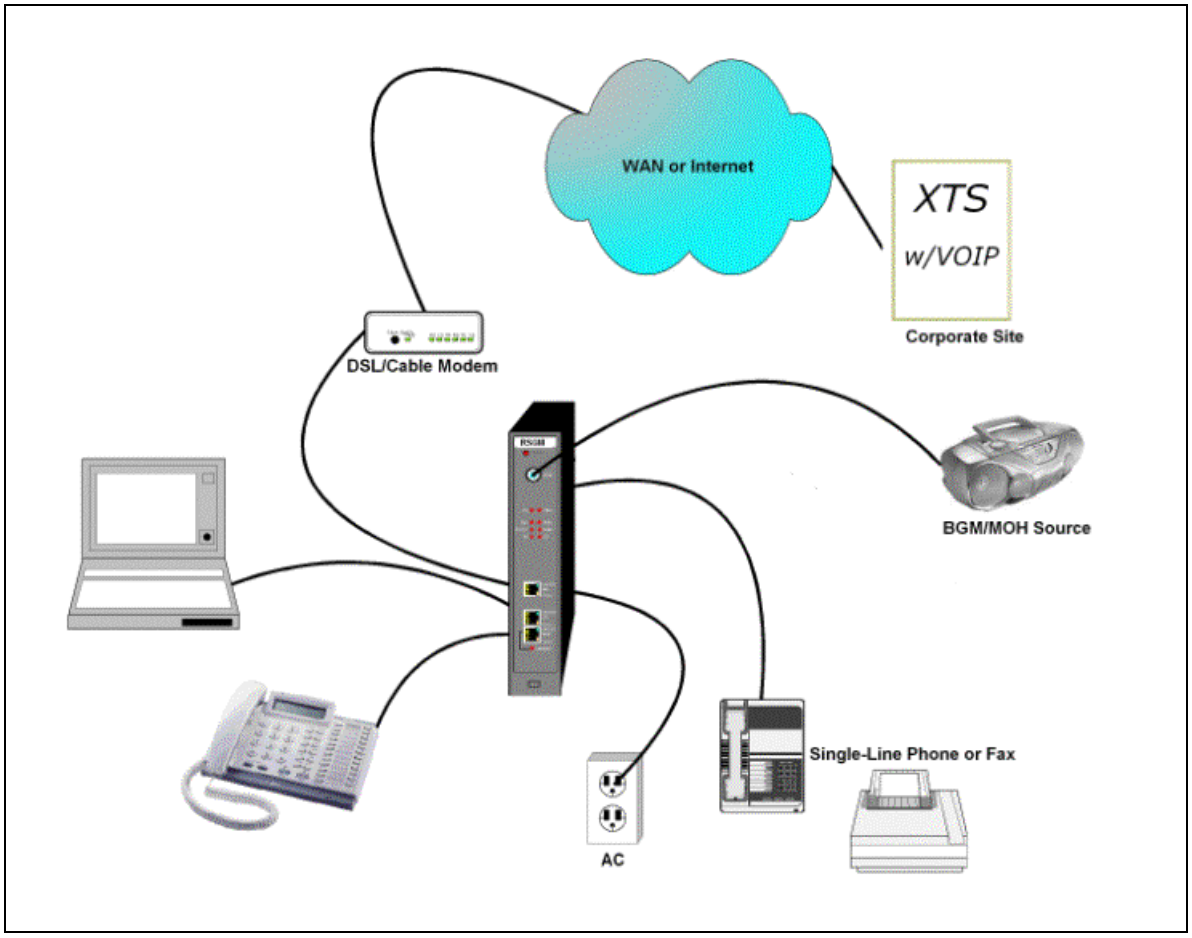
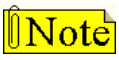


Figure 3-50: Remote configuration with Nomad RSGM

The *Nomad RSGM* typically comes pre-configured to assign DHCP addresses to hosts on its LAN (inside) port, and to receive a DHCP configuration on its WAN (internet) port. If the WAN side needs to be modified from using DHCP to a static address which you will enter, use the following instructions.

Changing Settings on the Nomad RSGM Unit

1. Plug the *Nomad RSGM*'s AC power adapter into the unit (there is no on/off switch).
2. Plug an Ethernet cable from your PC into the port which is marked **LAN[data].**
3. Set your PC's network connection to use DHCP, if it is not already configured to do so. Then renew your PC's IP configuration.
4. Verify that your PC has received an IP address configuration via DHCP from the *Nomad RSGM*. The DHCP range on the LAN side is typically set as 10.10.50.60-90.
5. Point your Web browser to http://10.10.50.50. This is the default inside LAN address for the *Nomad RSGM*.
6. You can now adjust the settings using the selections on the admin Web pages.



The setting for the IP address of the XTS IP system's VoIP card is called "MFIM address" on the Nomad RSGM's administration pages.

7. When finished, use the Reset command on the *Nomad RSGM*'s Web interface.

Administration via RS-232 (if necessary)

If the preceding procedure does not work, i.e., the unit cannot be accessed via its pre-set IP address because it loses its settings, access the unit via the RS-232 port on the *Nomad RSGM*.

1. Connect the RS-232 ports on the *Nomad RSGM* and your PC using a straight-through cable, then launch the terminal emulator program (e.g., HyperTerminal) and apply the following port settings:
   - Baud Rate: 38400
   - Data Bit: 8
   - Parity: None
   - Stop Bit: 1
   - Flow Control: None
2. Click OK. A blank window with a flashing cursor will display.

3. Press Enter, type **?**, then press Enter. The following menu commands display:

```
============================================================
  Command                        Description
============================================================
   wan                        Change to WAN Configuration
   lan                        Change to LAN Configuration
   system                     Change to System Configuration
   status                     Change to System Status
   trace                      Change to Trace Options
   passwd                     Change Password

   reset                      Reset RSGM
   exit (or x)                Exit Monitor Mode
   help (or ?)                Display Help on Menu


main:>
```

4. Type **wan**, then press Enter. The following displays:

```
main:> wan

 ================================================================
  Command                        Description
 ================================================================
   /                          Change to Root Catalog
   ..                         Change to Parent Catalog
   wanset                     Change to WAN Settings Catalog
   pppoe                      Change to PPPoE Catalog
   wanvlan                    Change to VLAN Catalog

main:/wan>
```

5. Type **wanset**, then press Enter. The following displays:

```
main:/wan> wanset

 ================================================================
  Command                        Description              Mode
 ================================================================
   /                          Change to Root Catalog
   ..                         Change to Parent Catalog
   mode                       Toggle Address Config Mode  : FIXED
   get all                    Read All Parameters
   get [arg]                  Read [arg] Parameter
                              {ip|subnet|gateway|dns|host|domain|
                               mac|blimit|mlimit}
   set ip [ipaddr]            Write (Fixed Mode) IP Address
   set subnet [ipaddr]        Write (Fixed Mode) Subnet Mask
   set gateway [ipaddr]       Write (Fixed Mode) Gateway Address
   set dns [ipaddr]           Write (Fixed Mode) DNS Address (..|del)
   set host [string]          Write (Fixed Mode) Host Name (..|del)
   set domain [domain]        Write (Fixed Mode) Doamin Name (..|del)
   set blimit [digt]          Write Broadcast Limit(%) (1-100)
   set mlimit [digt]          Write Multicast Limit(%) (1-100)

main:/wan/wanset>
```

6. Type **mode**, then press Enter to toggle from DHCP-assigned to statically assigned settings.
7. Type **get all**, then press Enter. The following displays:

```
main:/wan/wanset> get all

IP Address: 10.10.10.8
Subnet Mask: 255.255.255.0
Gateway Address: 172.16.10.100
DNS Address: N/A
Host Name: N/A
Domain Name: N/A
MAC Address: 00405a12866f
Broadcast Limit: 100 (%)
Multicast Limit: 100 (%)

main:/wan/wanset>
```

Note	*The MAC address value is unique for each device.*

8. Type **set ip** and the new WAN IP address to identify the *Nomad RSGM* (in our example, 172.16.10.85), then press Enter. The following displays:

```
main:/wan/wanset> get all

IP Address: 10.10.10.8
Subnet Mask: 255.255.255.0
Gateway Address: 172.16.10.100
DNS Address: N/A
Host Name: N/A
Domain Name: N/A
MAC Address: 00405a12866f
Broadcast Limit: 100 (%)
Multicast Limit: 100 (%)

main:/wan/wanset> set ip 172.16.10.85

IP Address Changed Successfully: 172.16.10.85

main:/wan/wanset>
```

9. Change Subnet Mask by typing **set subnet** 255.X.X.X, then press Enter.
10. Change Gateway (router) address by typing **set gateway** X.X.X.X (This is not a mandatory step).
11. Type **?**, then press Enter to access the help menu.

```
main:/wan/wanset> ?

 ================================================================
  Command                        Description              Mode
 ================================================================
   /                          Change to Root Catalog
   ..                         Change to Parent Catalog
   mode                       Toggle Address Config Mode  : FIXED
   get all                    Read All Parameters
   get [arg]                  Read [arg] Parameter
                              {ip|subnet|gateway|dns|host|domain|
                               mac|blimit|mlimit}
   set ip [ipaddr]            Write (Fixed Mode) IP Address
   set subnet [ipaddr]        Write (Fixed Mode) Subnet Mask
   set gateway [ipaddr]       Write (Fixed Mode) Gateway Address
   set dns [ipaddr]           Write (Fixed Mode) DNS Address (..|del)
   set host [string]          Write (Fixed Mode) Host Name (..|del)
   set domain [domain]        Write (Fixed Mode) Doamin Name (..|del)
   set blimit [digt]          Write Broadcast Limit(%) (1-100)
   set mlimit [digt]          Write Multicast Limit(%) (1-100)

main:/wan/wanset>
```

12. Type **/**, then press Enter to return to the main menu (Root Catalog).

```
main:/wan/wanset> /

 ============================================================
  Command                        Description
 ============================================================
   wan                        Change to WAN Configuration
   lan                        Change to LAN Configuration
   system                     Change to System Configuration
   status                     Change to System Status
   trace                      Change to Trace Options
   passwd                     Change Password

   reset                      Reset RSGM
   exit (or x)                Exit Monitor Mode
   help (or ?)                Display Help on Menu


main:>
```

13. Type **reset**, then press Enter.

IP Module - AC/DC Adapter

Each module is packaged with an AC/DC adapter. The adapter is supplied with a two-meter (six-foot) AC cord terminated with the nationally relevant AC blade type. The adapter supports AC input power systems with rated voltage range of 100-240 VAC @ 50/60 Hz. The adapter provides 48 VDC at 0.8 amps. The DC output connector is cabled to the adapter with a two-meter (six-foot) cable as shown in the following illustration.

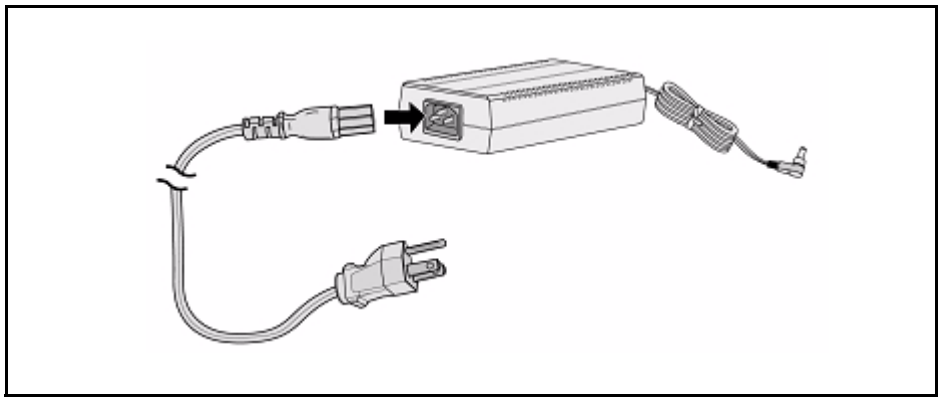


Figure 3-51: AC/DC Adapter for IP Module

Door Box

The Door Box is an intercom unit that can be installed at an entrance to a building. The unit houses a Call Button that a visitor can use for two-way communication with a person inside the building who has a keyset with a call coverage flexible button associated with the Call Box.

Alternatively, the unit can be mounted beyond the reach of visitors and wired to a conventional doorbell switch, which then serves as the Call Button. This option helps protect the Door Box from damage that might be caused by rough handling by visitors or vandals. The unit is wired into a DTIB port in the KSU.

Note	*SITE LOCATION ... Installing the Door Box in an enclosed area that offers environmental protection is recommended.*

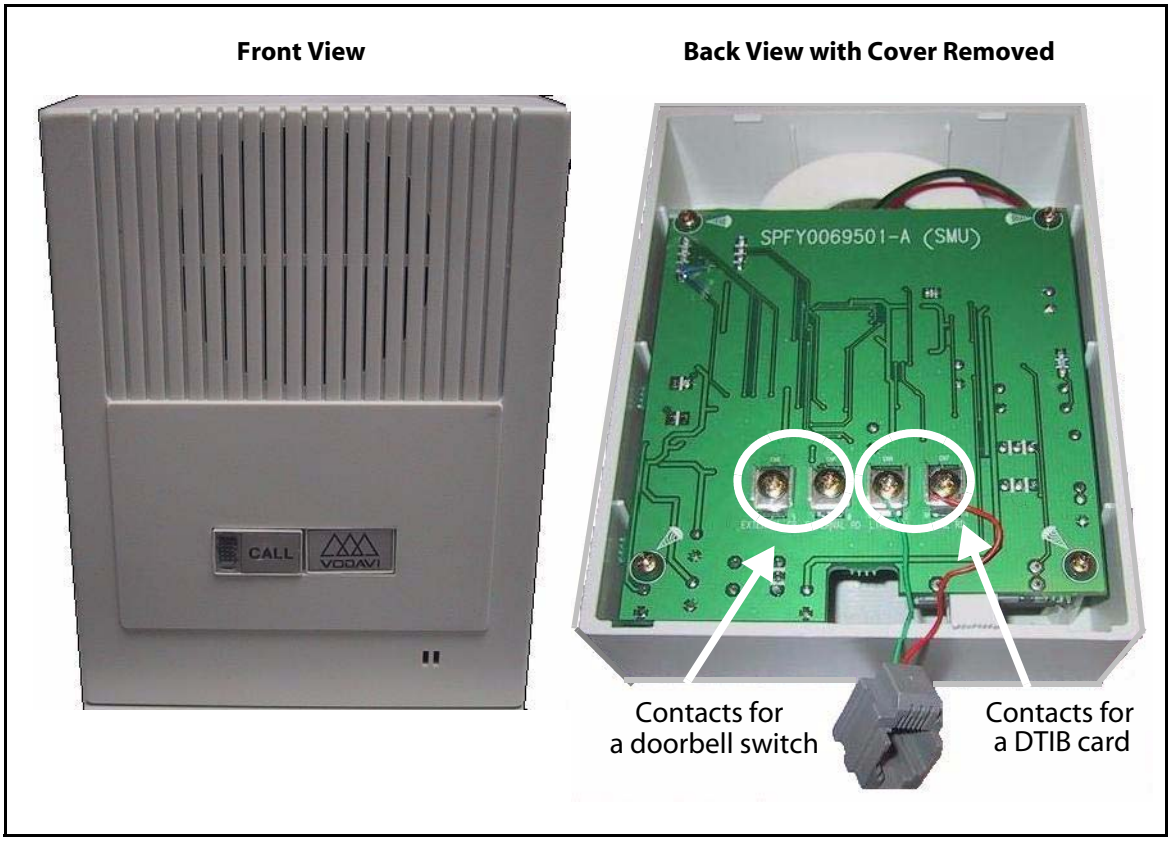


Figure 3-52: Door Box

4 Maintenance and Troubleshooting

This chapter is provided as a guideline in isolating and resolving functional problems that may be encountered as a result of improper use or component failure of the *XTS-IP*. Other failures, such as no dial tone from the central office, must also be considered as an overall troubleshooting procedure.

System & Database Check

System operation should be verified as per the programmed customer database once all customer database programming has been completed. A hard copy of the customer database can be printed from the system and should be kept on-site and up to date for future reference.

Note	*The system must be initialized **before** the Customer Database is programmed.*

The *XTS-IP* Systems are highly featured digital switches and as such, feature activation can sometimes be mistaken for improper operation.

Preliminary Verification

1. First, verify all programmable features are enabled for the phone or function in question.
2. Then compare the suspected improper operation with the feature operation description to determine which feature is causing conflict.

   Be aware that some features can override others and take precedence in operational priority.
3. Then make the necessary programming changes in customer database programming to acquire the desired operation.

General Troubleshooting

If feature operation is not the cause of the suspected problem, then general troubleshooting procedures should be employed. A basic guideline for determining the cause of a reported problem are as follows:

1. Verify that system programming is correct and that the suspected feature, circuit or function has been enabled in programming.
2. Check the unit on another circuit, if possible, and verify that it is functioning.
3. Check the installation cabling/wiring and connectors for cuts, shorts, or loose connections.
4. Check the system interface circuit by substituting a known good circuit. Verify the Service/Normal switch on the printed circuit board is in the *NORMAL* position.

   By verifying correct operation for each segment of the installation and system, the source of the problem is isolated and can be identified and resolved.

Telephone Troubleshooting

This section discusses general functions on a variety of key telephones available for use on the system. It is assumed that basic troubleshooting skills in the identification and resolution of basic problems are already possessed (e.g. static/noise heard on conversation, one phone only, replace worn handset cord).

Keyset Self Test

The *XTS-IP* contains a test mode feature that supports off-line testing of digital keysets and DSS units. The term off-line means that the unit under test cannot receive calls from the switch during the test operation. Keysets not under test continue to operate in the normal manner. Tests are provided to verify the keyset and DSS LED, LCD, and keyboard button operations.

1. Enter the test mode by lifting a keyset's handset to establish an off hook condition.
2. Press the SPEED button and dial [7#] on the dial pad. This disconnects the keyset from the system and brings up the Test Mode Menu on the keyset's LCD.
3. Exit Test Mode by placing the handset on hook to reconnect the keyset to the system.

Test Mode Menu -- The menu allows the operator to select a test mode by pressing the mode number at the dial pad. The operator can always return to the main test menu by pressing [##].

```
SELECT 1:LCDLED  2:KEYBTN  3:DSSBTN
```

Keyset LCD/LED Test

This test outputs a series of continuously repeated LCD string messages to LCD lines 1 and 2. The set of strings consists of the letters **A** through **X** and **a** through **x**. The next set of strings are:

```
"PICKUP  TRUCK  SPEED  ZONE !"
"*** STANDING BACK ***"
```

The strings are alternately displayed on lines 1 and 2 of the LCD display.

Keyset Button Test

1. Press a keyset button to turn on the LED and display an LCD message identifying the button number.

```
PRESS KEYSET BUTTONS
DIGIT1                    <--------
```

Each time the selected button is pressed it sequences through the flash rates available.

Table 4-1: Flash Rates

Button	ipm	Type
01	On	Steady
02	30	Flash
03	60	Flash
04	60	Double Wink
05	240	Flash
06	240	Flutter
07	480	Flash
08	480	Flutter
09	15	Flash
10	120	Flash
11	120	Flutter
12	30	Double Flash
13	480	Double Wink
14	480	Double Flash

2. Press the dial pad keys to display an LCD message that indicates which digit was pressed.

   Depressing the H-T-P switch from one position to another displays one the following words: H_POS, T_POS, or P_POS.
3. Test LEDs independently of the Keys by pressing the flexible LED button.

DSS LED/Button Test

When the DSS test is selected and a DSS test is invoked, ALL DSS units associated with the keyset are placed in the test mode.

```
PRESS DSS BUTTONS
                          <----------
```

If no DSS unit is associated with the keyset, the keyset display indicates NO DSS. The DSS LED test causes all the LEDs to light steady. All LEDs remain lit steady until a DSS flexible button is depressed. Pressing a DSS button turns on the DSS button LED and displays an LCD message on the associated keyset identifying the DSS button number (01 to 48). In addition, it turns off the previously selected flexible LED.

```
PRESS DSS BUTTONS
BTN01                     <----------
```

Conditions

» Test Mode interrupts the normal operation of a keyset or DSS.

Peripheral Cards and Components

The system can be equipped with various types of peripheral cards and components.

Key Telephones

The multi-line key telephones give both audible and visual indications of specific information in the telephone system.

Table 4-2: Key Telephones

Problem	Possible Solutions
No power to keyset …	Verify that keyset is connected to correct type of station card (digital or electronic).
No Handsfree Answer-back on intercom …	On digital keysets, the mode of intercom answer is programmable.
	On electronic keysets, make sure the intercom mode switch is in the HF position.
CO Line/Station Button won't access CO line/station …	Check Flexible button programming for that button.
Speakerphone doesn't work …	Check station programming for speakerphone allowed.
	Verify phone is a speakerphone model.
Can not call another intercom station …	Check programming for intercom access.
No Camp On signals or Override to phone …	Check station programming for Override enable.
Station response to wrong intercom number …	(adjacent circuit number only -110 & 111) Data pair of wires are reversed on electronic keysets (ETIB), or DSS.
	Check programming for assigned intercom number.

Single Line Telephones

The SLIB allows 2500-type Single Line Telephones to be connected to the telephone system.

Table 4-3: Single Line Interface Board - SLIBE/SLIBC w/MSGU48

Problem	Possible Solutions
No ringing to phone …	☐ Ensure a Ring Generator Unit (RGU) has been installed in Cabinet servicing that phone. ☐ Check CO Line Ringing Assignments in programming.
Message Waiting Lamp does not work …	☐ Check Station ID assignment in programming. ☐ Make sure a Ring Generator Unit (RGU) has been installed in Cabinet servicing that phone.
SLT can't receive dial tone …	☐ Ensure DTMF receivers are installed in the system. ☐ Check programming. ☐ Try another SLT to identify if the telephone instrument is defective. ☐ Try another SLIB to identify if the card is defective. ☐ Try resetting the MPB.
Poor transmission characteristics …	☐ Check for bad wiring. ☐ Try another SLIB to identify if the card is defective.

DSS/BLF Console

The DSS/BLF Consoles allows stations to have an additional 48 programmable buttons for one button access and immediate monitoring status capability of other stations.

Table 4-4: DSS/BLF Console

Problem	Possible Solutions
Buttons on DSS/BLF do not function as labeled …	Check Station Identification assignment in programming for correct DSS Map assignment.
Pressing buttons on DSS does not activate keyset …	DSS must be assigned to keyset in Station ID programming.
No power …	Verify unit is connected to the correct type of station board (digital or electronic).

CO Line Card Functions

The Loop Start CO Interface Board provides loop start line interface from the Public Telephone Network to provide ringing and loop start flash.

Table 4-5: Loop Start CO Interface Board (LCOBC)

Problem	Possible Solutions
8 Loop Start CO lines on the system are not working …	☐ Check wiring. ☐ Try a replacement LCOBC to identify if card is defective. ☐ Check programming.
CO Line(s) are not ringing …	Check CO Line Ring Assignment in programming.
Noise or Crosstalk on the line. (CO Line checks fine at demarcation point with system isolated) …	☐ Check whether CO lines are bundled too tightly. ☐ Try a replacement LCOBC to identify if card is defective.
CO Button not working …	☐ Check wiring. ☐ Check programming of CO lines.
Telephone side tone is high …	☐ Check LCOB Loop Length programming.

PRIB/BRIB ISDN and T1IB are digital CO interface boards.

Table 4-6: PRI/BRI ISDN and T1

Problem	Possible Solutions
Popping, crackling, dropped calls, or one-way transmission …	Verify the following settings and connections: ☐ The LD1 on the MPB is lit. ☐ The clock source switch on the LMU1 is set correctly for the external clock source being used. ☐ The clock cables are connected correctly. ☐ The clock switches on the BRIB/PRIB/T1 are set correctly.

System Functions

The following functions are related to system resources and the common equipment boards controlling them.

The Master Processor Board provides system central processing, real-time clock, digital (PCM) voice processing and gain control, feature control, customer database, system tone generation, and conference functions.

Table 4-7: Master Processor Board (MPB)

Problem	Possible Solutions
Complete system failure …	☐ Check AC power source. ☐ Replace the PMU. ☐ Replace the MPB. ☐ Reset the system.
SMDR and display phone time-of-day incorrect …	Re-program system time and date.
Loss of system intercom dial tone and call processing tones …	☐ Reset system. ☐ Replace MPB.
Loss of customer database programming …	Verify status of initialization switch and database backup battery connection.
SMDR RS232C Port inoperative …	Check programming.
Modem Port (or 2nd RS-232C port) inoperative …	Verify Modem Unit, MODU, is installed and programming is correct.
Cabinets 3, 4, and 5 inoperative . . .	☐ Check Link Cable ☐ Replace MPBE ☐ Replace LMUE ☐ Replace Link Cable

The Modem Unit provides an asynchronous modem for access to the system database and fault reporting features from a remote site. This unit also provides an RS-232 port for local access.

Table 4-8: Modem Unit (MODU)

Problem	Possible Solutions
Can not access system database programming remotely …	Check Modem programming.
Second RS-232C port is inoperative …	Check Modem Bypass programming.

The Program Module Unit (PMU) provides the system operating software.

Table 4-9: Program Module Unit (PMU)

Problem	Possible Solutions
The system is inoperative …	Ensure that an operable PMU is installed. The system does not operate without this component.

The Power Supply Unit (PSU) provides direct current power to the system in the form of +30VDC, +5VDC, and -5VDC. LEDs on the PSU in each cabinet show presence of each voltage type. Each PSU provides connections for batteries and charging current for batteries (optional).

Table 4-10: Power Supply Unit (PSU)

Problem	Possible Solutions
System does not operate (Loss of +5VDC) …	☐ Check LEDs on PSU. ☐ Check power switch.
Analog phones and CO Line do not operate (Loss of -5VDC) …	☐ Check LEDs on PSU. ☐ Check power switch.
Battery Back-up for system not working …	Check to ensure BATT SW is on.

The Miscellaneous Interface Board (MISB) provides external paging, external contact control, music on hold and background music inputs.

Table 4-11: Miscellaneous Interface Board (MISB)

Problem	Possible Solutions
The external paging port does not work …	☐ Check programming. ☐ Check wiring.
Some or none of the 4/6 external control contacts do not operate …	☐ Check programming. ☐ Check RAU.
Music on hold is not heard …	Check music source on MISB and volume control on music source.
Background music is not heard …	

The DTRU and DTRU4 provides dual tone multi frequency tones associated with dialing functions.

Table 4-12: DTMF Receiver Unit (DTRU/DTRU4)

Problem	Possible Solutions
DTMF Single Line Telephones can not dial out …	☐ If SLT has dial tone, check for installation of DTRU. ☐ If large volume of calls in the system, you may need to add additional DTRUs.
DISA calls can't dial system resources after call connection …	Check DISA programming.
DID lines won't ring intended station(s) …	Check DID programming.

Miscellaneous Functions

The following units are related to other system functions that are external to the KSU.

The Ring Generator Unit (RGU) provides ringing voltages for Single Line Telephones. Each Cabinet supporting SLTs must have an RGU installed.

Table 4-13: Ring Generator Unit (RGU)

Problem	Possible Solutions
Single Line Telephones do not ring when called on intercom …	Check RGU connection.
Message Waiting signal to Single Line Telephones with message waiting lamps does not light lamp …	Verify correct SLT type programmed (SLT with Msg Lamp in Station ID programming).

The Power Failure Transfer Unit (PFTU) provides automatic cut-over of up to 6 CO lines to up to 6 Single Line Telephones when system power or the central processor fails.

Table 4-14: Power Failure Transfer Unit (PFTU)

Problem	Possible Solutions
CO lines connected through the PFTU are never available to the system in normal operation …	☐ Make sure the NORMAL/TEST switch on the PFTU is in the Normal position. ☐ Check PFTU programming.

Station Card Functions

The system can be equipped with various types of station interface cards.

The digital key telephone interface board (DTIB) provides the interface for 12 or 24 Digital Telephones, DSS/BLF Consoles.

Table 4-15: Digital Key Telephone Interface Board (DTIB)

Problem	Possible Solutions
Unable to receive intercom dial tone …	☐ Reset the system. ☐ Check wiring.
Poor transmission characteristics …	☐ Check wiring. ☐ Replace DTIB.
Key telephone set inoperative …	Check station programming.
Key telephone unable to invoke features …	Check feature programming.
No LED indications …	Check using known operative keyset.

Maintenance Access

Maintenance

The Maintenance feature allows authorized personnel to survey system and slot configuration information. This feature may be accessed through a modem or data terminal connected to the RS-232C port on the MPB. The commands are entered from a keyboard.

Basic Command Format -- All commands begin with a single character, such as: c, d, r, x.

- Other commands begin with a single character and are followed by a space, another character, and an optional digit or digits.
- All commands are executed using the <Enter> key.

Password -- The password for the Maintenance feature is entered using a six-character alphanumeric string.

To access the password prompt:

- Press the <Enter> key of the device connected to the MPB COM1 port.
- When the *password*>prompt displays, type **config**, then press <Enter>.

  (Proper entry of the password will display the *maint*> prompt.)

Exit Maintenance

The exit command terminates the current Maintenance feature session. The exit command format is: *maint*>**x**

```
maint> ?
command list:
c         - clear log error trace
d s[nn]   - dump system or slot configuration data
            [nn] specifies an optional slot number parameter
            no parameter indicates that the entire system will be dumped
            examples:
                     maint>d s  (dumps entire system configuration)
                     maint>d s2 (dumps slot 2 configuration, etc.)
d b       (dumps busy device.)
d m       (dumps MAC stations.)
d e       (dumps event trace.)
d p       (dumps pp que error counts.)
r cxxx    (reset coline)
r kxx     (reset cab/slot)
r sxxx    (reset station)
d r       (dumps RCVR configuration.)
d r01     (toggle RCVR 01 stat & dumps configuration)
f p       (flush pp que error counts)
u         - upload/download flash rom software
t0..4     - set trace (off,soft start,cold start,soft/cold start,error log
x         - exit maint
?         - help menu
maint>
```

Figure 4-1: Remote Maintenance - Help Menu

System Configuration

This illustration shows the configuration of the *XTS-IP* System when the installer types **d<space>s** at the *maint*> prompt.

```
maint>d s
  CAB/SLOT   CARD   CKTS   SERV STAT    BRD OPTS    FW VER.
 ---------   ----   ----   ----------  ----------  ---------
   0   0      DT24   24       INS            0         00-0
   0   1      DTIB   12       INS            0         00-0
   0   2      T1IB   24       INS            0         10F-0
   0   3      PRIB   24       OOS            0         10C-0
   0   4      SLIB    6       INS            0         00-0
   0   5      LCOB    6       INS            0         00-0
   0   6      LCOB    6       INS            0         00-0
   0   7      DIDB    4       INS            0         00-0
   0   9      MPB     0       INS         V300         Eng. Vx.xx Pxx
 Station Count 42 Coline Count 63

maint>
```

Figure 4-2: Remote Maintenance - System Configuration

CAB	Shows the cabinet number for each board installed.
SLOT	Shows the slot position where each board is installed.
CARD	Identifies the type of board.
CKTS	Identifies the amount of circuits associated with the board.
SERV STAT	☐ Out-of-Service **(OOS)** status can indicate the entire card is out of service, or a specific station is not installed or installed but not operational. ☐ In-Service (**INS)** status can indicate a specific station is installed and operating correctly.
BRD OPTS	Lists any optional boards being used by the system.
FW VER.	Identifies the firmware version of each board.

CO/Station Configuration

This illustration shows what is printed out when the installer types **d<space>s0** at the *maint*> prompt.

```
maint>d s0
  CAB/SLOT    CARD    CKTS    SERV STAT     BRD OPTS     FW VER.
 ---------    ----    ----    -----------  ----------  ---------
   0   0       DTIB     12        INS             0         00-0

    STA
   FLEX-FIX-PORT     TYPE            STATUS      LCD     STATE
   ------------  --------       ---------   -----  --------

     110-110-010   30BTN            INS         Y     IDLE
     111-111-011   30BTN            INS         Y     IDLE
     112-112-012   30BTN            INS         Y     IDLE
     113-113-013   30BTN            INS         Y     IDLE
     114-114-014   30BTN            INS         Y     IDLE
     115-115-015   30BTN            INS         Y     IDLE
     116-116-016   30BTN            INS         Y     IDLE
     117-117-017   30BTN            INS         Y     IDLE
     118-118-018   30BTN            INS         Y     IDLE
     119-119-019   30BTN            INS         Y     IDLE
     120-120-01a   30BTN            INS         Y     IDLE
     121-121-01b   30BTN            INS         Y     IDLE
maint >
```

Figure 4-3: Remote Maintenance - CO/Station Configuration

STA (Station)

FLEX-FIX-PORT Shows the flexible and fixed numbers that were assigned to each available port.

TYPE Shows the type of telephone being used by a station.

STATUS
- Out-of-Service **(OOS)** status can indicate the entire card is out of service; or a specific station is not installed; or a station is installed but not operational.
- In-Service (**INS)** status can indicate a specific station is installed and operating correctly.

LCD Indicates whether or not the station has a telephone with an LCD Display.

STATE Shows the condition of each station: idle/available/unavailable.
Type of Station (keyset, DSS, SLT)
Keyset - ID 0 = Key station
DSS/BLF - ID 1 = DSS Map 1
DSS/BLF - ID 2 = DSS Map 2
DSS/BLF - ID 3 = DSS Map 3
DSS/BLF - ID 4 = DSS Map 4
SLT - ID 5 = SLT
SLT w/Lamp - ID 6 = SLT w/Message Waiting

This illustration shows what is printed out when the installer types **d<space>s2** at the *maint*> prompt and slot 2 houses a T1IB card.

```
maint> d s2
  CAB/SLOT   CARD   CKTS   SERV STAT    BRD OPTS    FW VER.
 ---------   ----   ----   -----------  ----------  ---------
   0   2      T1IB   24       INS            0         xxx-x

EVENT DESCRIPTION    ALARM    # OF  ACTIVE  MOST RECENT
                              EVENTS        (MM-DD-YY HH:MM:SS)
 CARRIER LOSS          Y        0      N    00-00-00 00:00:00
 YELLOW ALARM          Y        0      N    00-00-00 00:00:00
 BLUE ALARM            Y        0      N    00-00-00 00:00:00
 RED ALARM             Y        0      N    00-00-00 00:00:00
 SLIP                  Y        0      N    00-00-00 00:00:00
 BIPOLAR VARIATIONS    Y        0      N    00-00-00 00:00:00
 DATA ERRORS           Y        0      N    00-00-00 00:00:00

  CO-PORT      STATUS    Grp Type  PULSE/DTMF  CO/PBX  STATE
 --------  ---------------------  ----------  ------  -----
   1-026   INS, Bothway    1  2      DTMF      CO    IDLE
   2-027   INS, Bothway    1  2      DTMF      CO    IDLE
   3-028   INS, Bothway    1  2      DTMF      CO    IDLE
   4-029   INS, Bothway    1  2      DTMF      CO    IDLE
   5-02a   INS, Bothway    1  2      DTMF      CO    IDLE
   6-02b   INS, Bothway    1  2      DTMF      CO    IDLE
   7-02c   INS, Bothway    1  2      DTMF      CO    IDLE
   8-02d   INS, Bothway    1  2      DTMF      CO    IDLE
   9-02e   INS, Bothway    1  2      DTMF      CO    IDLE
  10-02f   INS, Bothway    1  2      DTMF      CO    IDLE
  11-030   INS, Bothway    1  2      DTMF      CO    IDLE
  12-031   INS, Bothway    1  2      DTMF      CO    IDLE
  13-032   INS, Bothway    1  2      DTMF      CO    IDLE
  14-033   INS, Bothway    1  2      DTMF      CO    IDLE
  15-034   INS, Bothway    1  2      DTMF      CO    IDLE
  16-035   INS, Bothway    1  2      DTMF      CO    IDLE
  17-036   INS, Bothway    1  2      DTMF      CO    IDLE
  18-037   INS, Bothway    1  2      DTMF      CO    IDLE
  19-038   INS, Bothway    1  2      DTMF      CO    IDLE
  20-039   INS, Bothway    1  2      DTMF      CO    IDLE
  21-03a   INS, Bothway    1  2      DTMF      CO    IDLE
  22-03b   INS, Bothway    1  2      DTMF      CO    IDLE
  23-03c   INS, Bothway    1  2      DTMF      CO    IDLE
  24-03d   INS, Bothway    1  2      DTMF      CO    IDLE

maint>
```

Figure 4-4: Example of T1IB in Cabinet 0, Slot 2

This illustration shows what is printed out when the installer types **d<space>s2** at the *maint*> prompt and slot 2 houses a VoIP24 card.

```
maint> d s2
  CAB/SLOT   CARD   CKTS   SERV STAT    BRD OPTS    FW VER.
 ---------   ----   ----   -----------  ----------  ---------
   0   2     VO24    24       INS            0         xxx-x
Mac/IP Address & RTP : 000000000000 067099001019 - 0

   STA
FLEX-FIX-PORT  TYPE      STATUS LCD MAC/IP/STATE
 ------------ --------- ------ --- ----------------
2148-148-04d  IP KEYSET  INS    1  00405a127cdd 067098071042 IDLE
2149-149-04e  IP KEYSET  OOS    1  000000000000 067098071042 IDLE
2150-150-04f  IP KEYSET  OOS    1  000000000000 010010010011 IDLE
2151-151-050  IP KEYSET  OOS    1  000000000000 010010010012 IDLE

                         Group   PULSE  CO
  CO-PORT       STATUS    Type    DTMF   PBX     MAC/STATE
 --------  ------------- ------  ------ ---     ---------
   1-033   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
   2-034   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
   3-035   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
   4-036   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
   5-037   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
   6-038   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
   7-039   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
   8-03a   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
   9-03b   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
  10-03c   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
  11-03d   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
  12-03e   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
  13-03f   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
  14-040   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
  15-041   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
  16-042   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
  17-043   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
  18-044   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
  19-045   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
  20-046   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
  21-047   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
  22-047   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
  23-049   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
  24-04a   INS, Bothway   3  2   DTMF   CO    000000000000 IDLE
  25-04b   INS, Bothway   0  2   DTMF   CO    000000000000 IDLE
  26-04c   INS, Bothway   0  2   DTMF   CO    000000000000 IDLE

maint>
```

Figure 4-5: Example of VoIP24 Card in Cabinet 0, Slot 2

Dump MAC Addresses

This illustration shows what is printed out when the installer types **d<space>m** at the *maint*> prompt.

```
maint> d m

SLOT STA
02 K2148 STA_MAC_ADD   MAC_ADD1      MAC_ADD2     MAC_ADD3      IP_ADD   STATUS
02 K2149 00405a127cdd 00405a127cdd 000000000000 000000000000 067098071042 INS
02 K2150 000000000000 0000c00271ef 000000000000 000000000000 067098071042 OOS
02 K2151 000000000000 00405a12a8fd 000000000000 000000000000 010010010011 OOS
03 K2152 000000000000 00405a1277a3 000000000000 000000000000 010010010012 OOS
03 K2153 000000000000 000000000000 000000000000 000000000000 000000000000 OOS
03 K2154 000000000000 000000000000 000000000000 000000000000 000000000000 OOS
03 K2155 000000000000 000000000000 000000000000 000000000000 000000000000 OOS
03 K2156 000000000000 000000000000 000000000000 000000000000 000000000000 OOS
03 K2157 000000000000 000000000000 000000000000 000000000000 000000000000 OOS
03 K2158 000000000000 000000000000 000000000000 000000000000 000000000000 OOS
03 K2159 000000000000 000000000000 000000000000 000000000000 000000000000 OOS
03 K2160 000000000000 000000000000 000000000000 000000000000 000000000000 OOS
03 K2161 000000000000 000000000000 000000000000 000000000000 000000000000 OOS
03 K2162 000000000000 000000000000 000000000000 000000000000 000000000000 OOS
03 K2163 000000000000 000000000000 000000000000 000000000000 000000000000 OOS
03 K2164 000000000000 000000000000 000000000000 000000000000 000000000000 OOS
03 K2165 000000000000 000000000000 000000000000 000000000000 000000000000 OOS

maint>
```

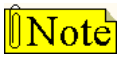
STA_MAC_ADD	–	Shows the MAC address that is currently in service
MAC_ADD1	–	Shows 1 of 3 MAC addresses that can be assigned/activated for a station
MAC_ADD2	–	Shows 1 of 3 MAC addresses that can be assigned/activated for a station
MAC_ADD3	–	Shows 1 of 3 MAC addresses that can be assigned/activated for a station
IP_ADD	–	Shows the IP address of the station
STATUS	–	Shows status of the station; INS = Inservice, OOS = Out of Service

Event Trace Buffer

The Event Trace Buffer is used to store and dump event traces (up to 30) that occur just prior to an *XTS-IP* System soft or hard restart. These can be reviewed by authorized personnel to aid in system troubleshooting. The basic format for each command is shown in the following table:

Table 4-16: Event Trace Buffer Commands

Command	Function
t<space><Enter>	Displays the current status of the Event trace buffer.
t<space>0<Enter>	Turns the Trace buffer OFF.
t<space>1<Enter>	Turns the Trace buffer ON to record events prior to a soft system reset.
t<space>2<Enter>	Turns the Trace buffer ON to record events prior to a hard system restart.
t<space>3<Enter>	Turns the Trace buffer ON to record events prior to either a soft reset or a hard system restart.
d<space>E<Enter>	Dumps Trace Events stored from last system reset (soft or hard).
d<space>b<Enter>	Permits maintenance personnel to determine the busy status of all the busy keysets and CO Lines in the system, including the T1 lines.
r<space>SXXX<Enter>	Permits a specific station to be reset.
r<space>CXX<Enter>	Permits a specific CO Line to be reset.



Press <Ctrl + C> to abort the Data Dump and return to the maint> prompt.

DTMF Receiver Trace

The CONFIG utility allows technicians to take specific DTMF receivers in/out of service. This is useful for troubleshooting DTMF receiver problems to isolate a specific DTMF receiver that may be faulty.

To view the status of all DTMF receivers in the system:

1. Connect a terminal to I/O Port 1 on the MPB.
2. At the *Enter Password*> prompt, type **config**, then press <Enter>.
3. Then type: **d**<space>**r**<Enter>

   The display will show the receiver number, cabinet location, card slot location, receiver status, and state of the receiver.

```
maint> d r
 RCVR   CAB   SLOT   STAT   USER
 ----   ---   ----   ----   ----
  00     0     09    INS    IDLE
  01     0     09    INS    IDLE
  02     0     09    INS    IDLE
  03     0     09    INS    IDLE
  04     0     07    INS    IDLE
  05     0     07    INS    IDLE
  06     0     03    INS    IDLE
  07     0     03    INS    IDLE
  08     0     03    INS    IDLE
  09     0     03    INS    IDLE
  10     0     02    INS    IDLE
  11     0     02    INS    IDLE
  12     0     02    INS    IDLE
  13     0     02    INS    IDLE
maint>
```

To make a receiver unavailable:

Type: **d**<space>**rXX**<Enter>
(XX is the specific receiver number to make unavailable)

To make a receiver available:

Type: **d**<space>**rXX**<Enter>
(XX is the specific receiver number to make available)

Monitor

The Monitor feature provides access to the installed system for diagnostic purposes. These capabilities benefit Service personnel which enables them to support the end user remotely.

Different levels of access, via password, allows authorized personnel to trace, monitor and upload critical information directly from the *XTS-IP* System. This provides a more accurate means of acquiring system information that leads to a quick resolution of problems that may occur. This is all done without interfering with ongoing call processing or normal system operation, and in many cases may be performed without a site visit. Port 1 on the MPB and the modem are used for monitor access.

The capabilities allowed and reserved for this *high-level troubleshooting* are:

Monitor Mode

Enable & Disable Event Trace

Dump Trace Buffer (up-load)

Monitor Password

The Monitor password (like *Maintenance*), is entered using a six-character alphanumeric string.

To access the password prompt:

1. Press the <Enter> key of the device connected to the SIU or SIU2 Module.
2. When the *password*>prompt displays, type **etrace**, then press <Enter>.
   (Proper entry of the password will display the *mon*> prompt.)

Note	*The Monitor feature is intended for use only under the guidance and instruction by authorized personnel from VODAVI Technical Support.* *Care and caution must be observed when using this feature as permanent damage to the software structure can occur.*

Help Menu (?)

A convenient on-screen Help Menu is provided by typing the **?** character, then pressing the <Enter> key. The following commands will display:

```
mon> ?
command list:
 ?         - help menu
 a board   - board-cmd slot,cmd,data1,data2
 c [c]     - dump co data
 d [a][a]  - dump memory
 e [s]     - dump prot sta data
 f         - flush minor alarm log
 g [s]     - dump local sta data
 h         - hdlc status report
 k         - key-cmd sta,cmd,data1...data17
 l         - display minor alarm log
 m add     - modify memory
 n         - display stack trace
 p         - Send Sta Event (Sta Event Data1 Data2)
 q         - Send Sta Event (Sta Event Data1 Data2) & exit monitor
 s [s]     - dump sta data
 t [d]     - set trace key
 x         - exit monitor
mon>
```

Figure 4-6: Remote Monitor - Help Menu

Dump Memory Data

Three options allow the memory structure to be *dumped* for viewing. The three options are entered as follows:

c [c] – Dump CO Line memory structure

s [s] – Dump Station memory structure

d [a][a] – Dump a memory address structure

The data obtained from these commands is in hexadecimal format and is used primarily for manufacture-level support.

Note	*Press <Ctrl + C> to abort the Data Dump and return to the mon> prompt.*

Event Trace Mode

The "t" command enables and disables the Trace mode in the *XTS-IP* System. While the trace mode is enabled, events for the trace selected are displayed in an event record on the monitor, printer, or PC connected to the *XTS-IP* System.

To view the current status of the trace mode:

1. Type **t** at the *mon*> prompt.
2. Then press <Enter> to display the following commands:

```
mon> t
Cmd   Messages    Y/N
---   --------    ---
 B - BOARD EVT  -> N
 C - COL States -> N
 D - Dev PP Cmd -> N
 E - Error Msg  -> N
 H - H/W States -> N
 I - CTI PP Msg -> N
 K - LCD PP Cmd -> N
 L - LED PP Cmd -> N
 M - MSC States -> N
 P - PCM        -> N
 Q - Que Evt    -> N
 S - Stn States -> N
mon>
```

Figure 4-7: Remote Monitor - Trace Mode Status

To enable an Event Trace:

1. Type: **t<**space**>(**followed by the letter that indicates the kind of specific trace needed)
   - B = Board event trace (traces events associated with PCBs)
   - C = CO Line (LCOB) States (traces events associated with CO Line activity)
   - D = Device Command (traces commands to peripheral devices)
   - E = Error Messages (traces error messages)
   - H = Hardware States (traces events associated with hardware states)
   - I = CTI (traces from and to devices)
   - K = LCD (traces commands to devices)
   - L = LED (traces commands to devices)
   - M = Miscellaneous State event trace
   - P = Pulse Coded Modulation (PCM) traces events associated with voice communications
   - Q = Queue (QUE) Events (traces queuing events, e.g.: DTMF receiver, UCD, LCR, etc.)
   - S = Station (STA) States (traces events associated with Station activity)

2. Type the specific board, CO line, or Station number of the trace desired,
   -or-
   Type **all** if all boards, CO line, or Station events are desired.

3. Then press <Enter> to enable the trace.

To disable or turn off a particular Trace Mode:

Do not enter a specific board, CO Line, or Station Number

(i.e., t<space>s<Enter> to disable station event trace).

To display an Event Trace on screen:

Type **x** at the *mon*> prompt to exit the MONitor mode. Once you exit the event, the trace will begin as shown in *Figure 4-8*.

	Unless instructed by personnel at VODAVI Technical Support, do not leave the trace mode enabled for extended periods of time. The system dumps the requested event(s) trace which may use up paper or fill memory buffers on the collecting device. It is recommended that the trace events be disabled (turned off) for all event(s) traces before leaving the system site.

Modify Memory Command

The modify memory command is for engineering use only.

	Use of this command can alter or damage the XTS-IP System's operating database which can result in system malfunction. *If this occurs it is necessary to power the system down and re-initialize the database, then completely reprogram the customer programming data.*

Exit the Monitor Mode

The exit command terminates the current Remote Monitor enable/disable session. If an Event Trace is still enabled, the event records are displayed only after exiting the MONitor mode. The exit command format is: *mon*> x

Unless instructed by personnel at Vodavi Technical Support, do not leave the trace mode enabled for extended periods of time.

The system dumps the requested event(s) trace which may use up paper or fill memory buffers on the collecting device.

It is recommended that the event traces be disabled (turned off) for all event(s) before leaving the system site

```
300 Digital Hybrid Key-System
Eng. V0.00 POX-FFFF DATE: MM/DD/YY TIME: 13:04:59
ENTER PASSWORD:
1305021 002 0000 0002 0000 K7300        IDLE - Dial Pad 2
1305022 002 0000 0002 0000 K7300        DIALING - Dial Pad Release
1305025 002 0000 0007 0000 K7300        DIALING - Dial Pad 7
1305026 002 0000 0007 0000 K7300        DIALING - Dial Pad Release
1305029 002 0000 000a 0000 K7300        DIALING - Dial Pad 0
1305030 002 0000 000a 0000 K7300        DIALING - Dial Pad Release
1305031 002 0000 000a 0000 K7300        DIALING - Dial Pad 0
1305031 002 0001 ffff 0000 K7300        DIALING - All Call
1305033 002 0000 000a 0000 K7300        PAGING - Dial Pad 0
1305052 002 0000 0000 0000 K7300        PAGING - Off Hook
1305257 002 0000 0000 0000 K7300        PAGING - On Hook
Mon>
```

Figure 4-8: Event Trace

```
1319043 050 0200 8020 002f C  31 PRIpp RINGING - REMOTE INFO
1319043 050 1e03 0028 0029 C0031       IN_RING - Info 0S3108
PAUL CALLING
1319044 050 1e03 0006 0000 C0031       IN_RING - Acd Pc Data
1319137 050 1f03 0000 0000 C0031       IN_RING - Preset Fwd T/O
1319182 002 1e03 0000 0033 K1100       IDLE - Off Hook
1319183 032 0003 0001 0000 C0001       IDLE - Keyset Restart
Ring
1319183 050 0000 0000 0032 C  31 PRIcp RINGING - CP ANSWER
1319183 050 1e03 0000 0000 C0031 K1100 TALK - Seize Ack
1319184 002 1f03 0000 0000 K1100 C0031 COL_CONNECTED - Ring
Update T/O
1319188 050 3353 0002 0000 C0031 K1100 TALK - Acd Pc Data
1319193 002 1e03 0000 0000 K1100 C0031 COL_CONNECTED - LCD Dsp
T/O
1319201 002 0001 0000 0033 K1100 C0031 COL_CONNECTED - On Hook
1319202 050 1e03 0001 0002 C0031       RELEASING - Keyset
Restart Ring
1319202 050 0000 0000 0031 C  31 PRIcp TALK - CP RELEASE
1319212 050 0200 805a 0024 C  31 PRIpp DISCONN REQ - CLR REQ
1319212 050 1e03 0010 0000 C0031       RELEASING - Release Ack
1319265 051 0200 9820 002f C  32 PRIpp IDLE - REMOTE INFO
1319265 051 1f03 0007 0000 C0032       WAIT_IDLE - Info 0D3108i
1319365 002 0003 0003 0038 K1100       IDLE - Dial Pad 3
1319367 002 1f03 0003 0038 K1100       DIALING - Dial Pad
Release
```

Figure 4-9: Event Trace in a Networking System

Flash ROM Software Update

Save/Download your KSU database (refer to *"Database UPload/Download Routine"* in Appendix F of the Programming and Operations Manual), then perform the following steps to update Flash ROM Software.

1. Connect a terminal to I/O Port 1 on the MPB, then press <Enter> several times until the following system data displays:

```
300 Digital Hybrid Key System
Eng. V1.00 P0X-FFFF DATE:MM/DD/YY TIME: 11:10:27
ENTER PASSWORD:
```

2. At the *ENTER PASSWORD*: prompt, type **config**.
3. Press <Enter>, the following *maint*> prompt will display:

```
maint>
```

4. Type **u** to select "upload/download flash rom software" option, then press <Enter>. The following will display:

```
Enter password>
```

5. Type the remote admin password (**3226vodavi** = default password), then press <Enter>.

Note	*The password characters will not display on the screen as the password is being typed.*

The following command options and system prompt will display:

```
COMMAND DESCRIPTION
_____________________
b         show baud rate
s         bank switching
u         upload software using zmodem
x         Exit
? or h    Help, Guide

maint>swupdown>
```

6. Type **u** and press <Enter>. The following messages will display:

```
Software Upload initiated...

SRAM (512 K-bytes) allocation succeeded...
Software in bank 1 will be erased now...
Please, wait...

Bank 1 erasure is completed...
Please, start Z-modem transfer...

Upload with baud rate [19200 bps]

To continue, please type Yes [y], or No [n]:
```

7. Type **y** to start the Flash ROM update. The following message will display:

```
Upload file with zmodem...
```

8. Use one of the following methods to set the file location and protocol.
   For Hyper Terminal:
   a. Use the "transfer" panel to select the "send file" option
   b. Then select the object code file to be uploaded to the *XTS-IP*.
   c. Select the "Zmodem" protocol, then click "Send".
      -or-
   For ECOM:
   a. Use the "files" panel to select the "upload" option.
   b. Then select the "Zmodem" upload protocol and click "OK".
   c. Select the object code file to be uploaded to the *XTS-IP*, then click "OK".

Any loss of power or manual reset of the system at this point in the upgrade process (during bank switching) will render the system inoperable.

After the upload is complete, the following messages will display:

```
Upload succeeded!

Please, wait until bank data programming is finished...

Z-modem transfer completed...
Uploaded software lies in bank 1...

Do you want to switch the banks of flash ROM now (y/n)?
```

9. Type **y** to switch the banks of Flash ROM now, or type **n** if you wish to switch at a later time. If "y" is selected, the following messages will display:

```
Bank 0 has valid software key...
Bank 1 has valid software key...

Please, wait until bank switching is finished and
system is reset automatically...
After reset, banks would be switched as requested...

Please maintain power during the process. Please wait..
```

   After the software is switched successfully, the *XTS-IP* system will restart automatically.

10. To use the newly loaded software, place switch 8 to the on position (to default KSU database). Power the *XTS-IP* system Off or On, whichever applies. When the system is up, place switch 8 to the off position and upload the database (refer to *"Database UPload/ Download Routine"* in Appendix F of the Programming and Operations Manual). After the upload, cycle KSU power.

To switch to the new software at a later time:

1. Connect a terminal to I/O Port 1 on the MPB. The following is an example of the data that will display:

```
300 Digital Hybrid Key System
Eng. V1.00 P01-FFFF DATE:MM/DD/YY TIME: 11:10:27
ENTER PASSWORD:
```

2. Type the password **config** and press <Enter>. The following prompt will display:

```
maint>
```

3. Type **u** to select the "upload/download flash rom software" option. The following password prompt will display:

```
Enter password>
```

4. Type the remote admin password (**3226vodavi** = default password), then press <Enter>.

Note	*The password characters will not display on the screen as the password is being typed.*

The following command options and system prompt will display:

```
COMMAND DESCRIPTION

_____________________
b         show baud rate
s         bank switching
u         upload software using zmodem
x         Exit
? or h    Help, Guide

maint>swupdown>
```

5. Type **s** and press <Enter> to enable bank switching.

Note	*The "s" command is used as a toggle. Therefore, if bank switching is enabled, type **s**, and then press <Enter> to disable.*

The following message will display:

```
Bank switching is enabled...
Please, make a reset to initiate switching banks...
```

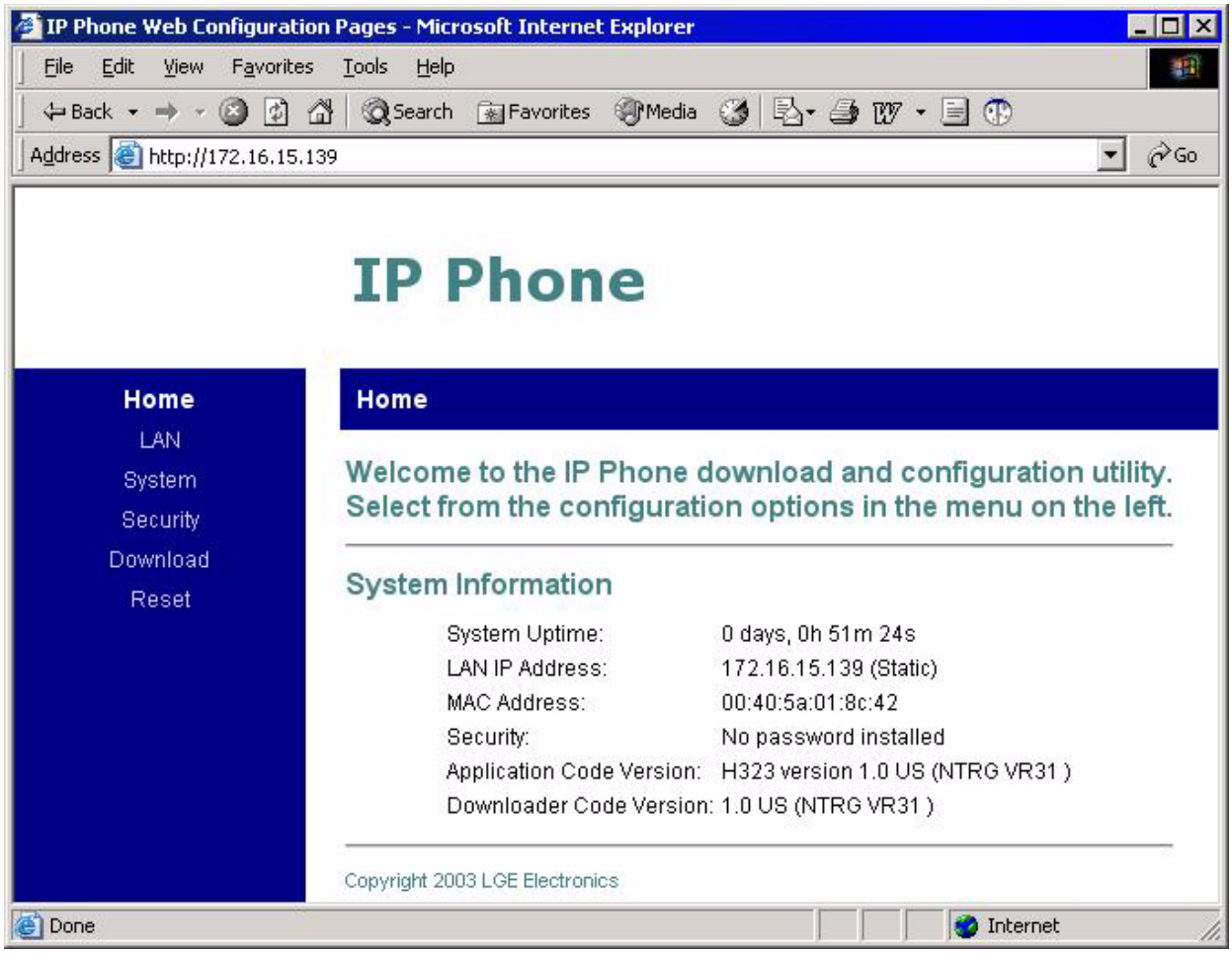
6. To use the newly loaded software, place switch 8 to the on position (to default KSU database). Power the *XTS-IP* system Off or On, whichever applies. When the system is up, place switch 8 to the off position and upload the database (refer to *"Database UPload/ Download Routine"* in Appendix F of the Programming and Operations Manual). After the upload, cycle KSU power.

Upgrade IP Phone Software

1. Launch your web browser.
2. Type **http://** followed by the IP Phone IP address (for our example, 172.16.15.139) into the Address box, then press Enter. If the security setting requires a password, the following window will appear.

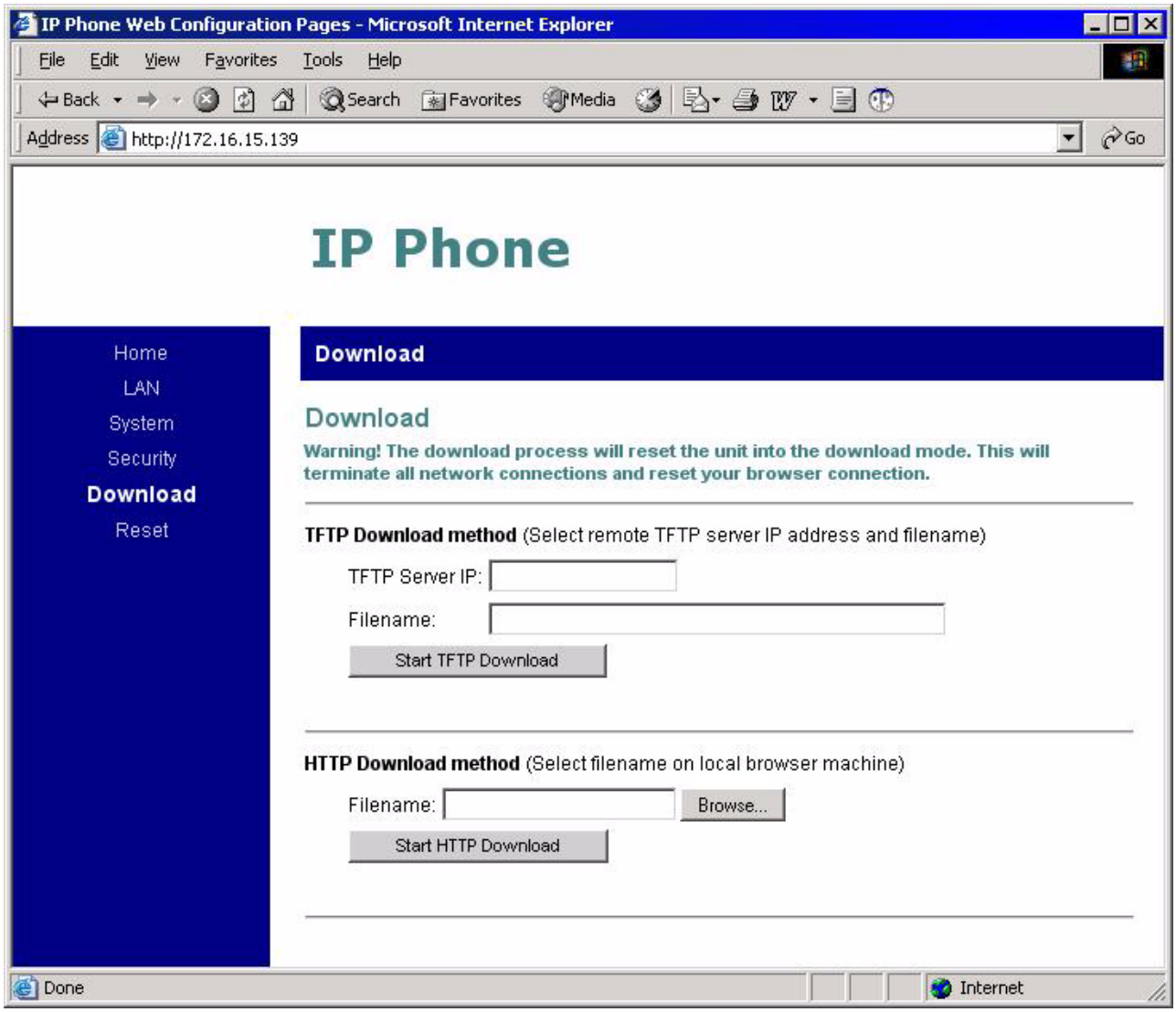
3. Type the password, then click on the Authenticate button. By default, IP-24DH telephones do not have a password assigned. The default password for IP7008D and IP7024D telephones is **ipkts**. If a password is assigned and then the password is forgotten, the password can be cleared (refer to *page 4-39* for the procedure to clear the password).

4. A window similar to the following displays:

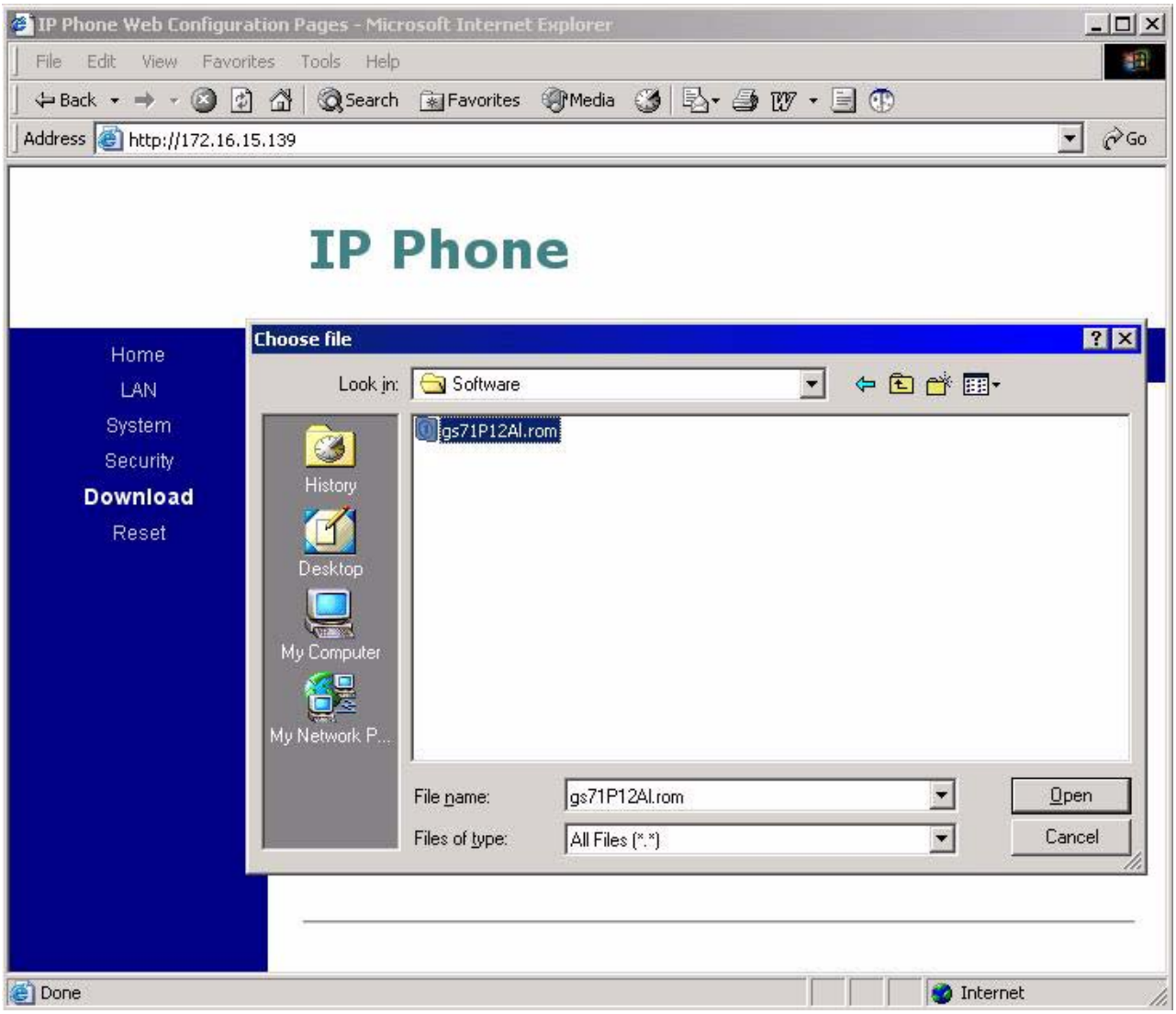


Note	*Under certain conditions (slow network connection or slow PC), the download may not work and a window will display showing "Action Cancelled". If this occurs, use the procedure that follows this one on page 4-36 to continue the download.*

5. Click the **Download** option on the left side of the window in the Blue area. The following displays:

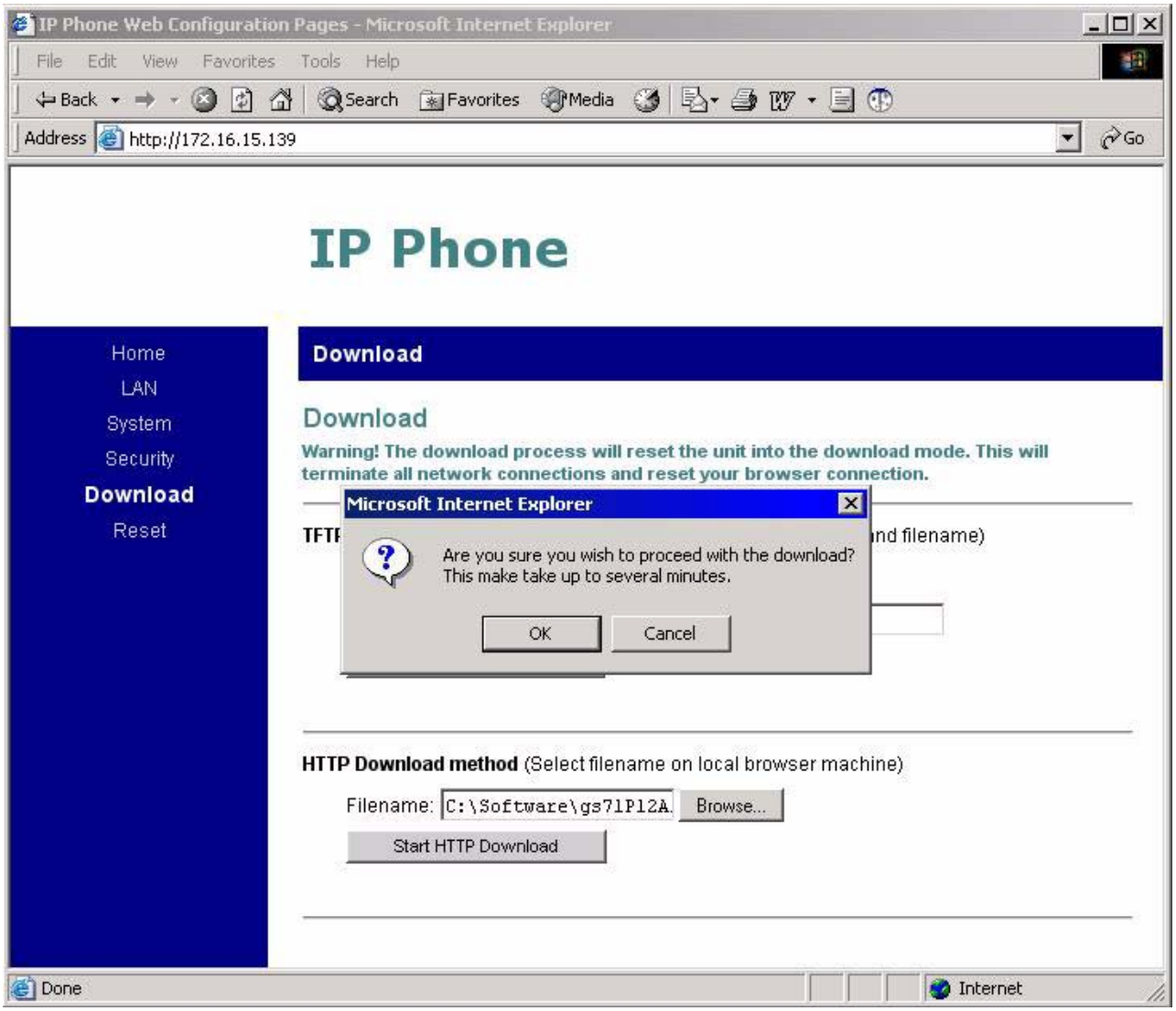


6. Use the HTTP download method and click the **Browse** button in the lower portion of the window. The following "Choose file" window displays:



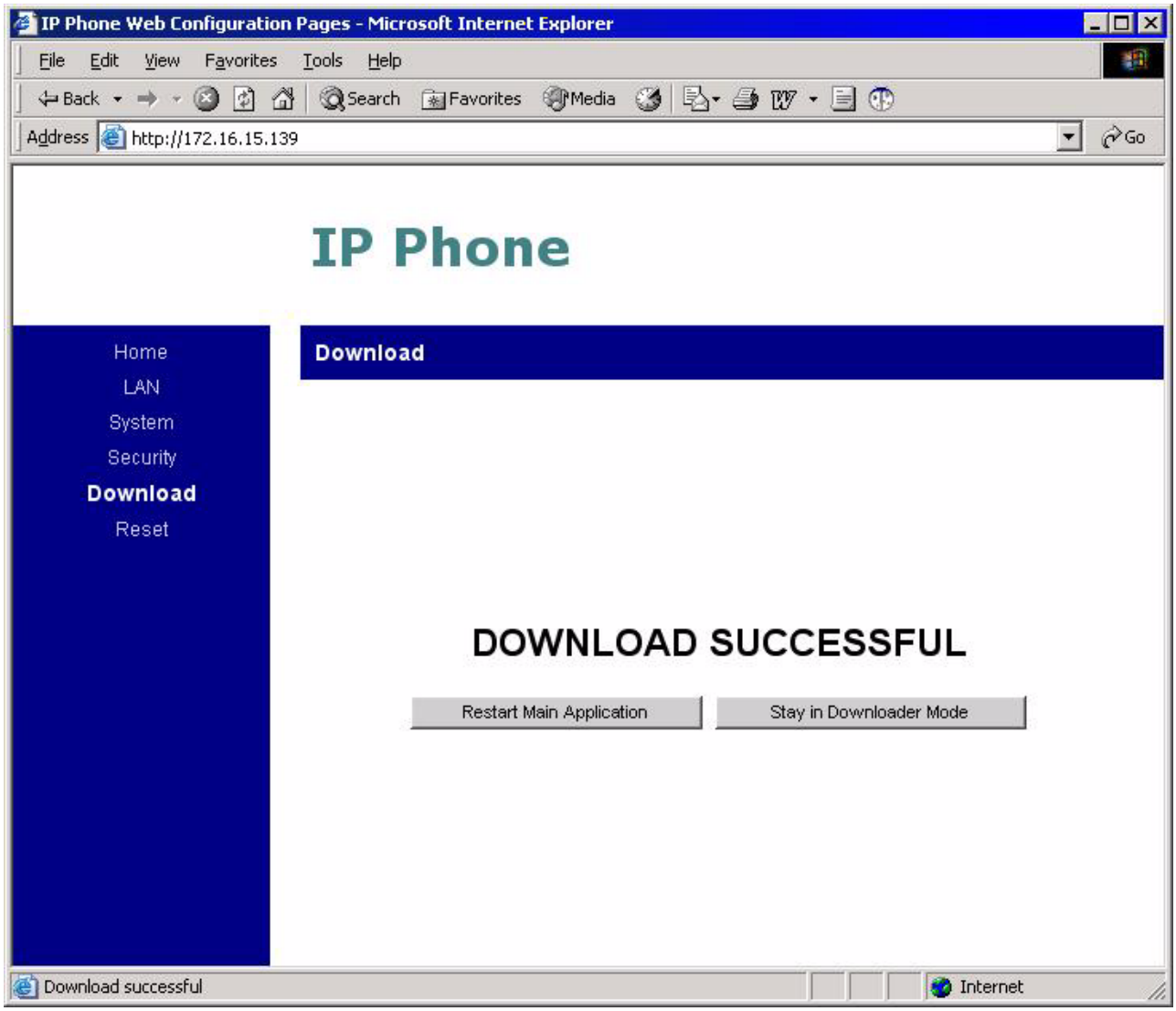
7. Browse to find and select the file containing the new software upgrade (It will have a .rom extension), click the Open button, then click on **Start HTTP download**.

The following displays to make sure you wish to proceed with the download.



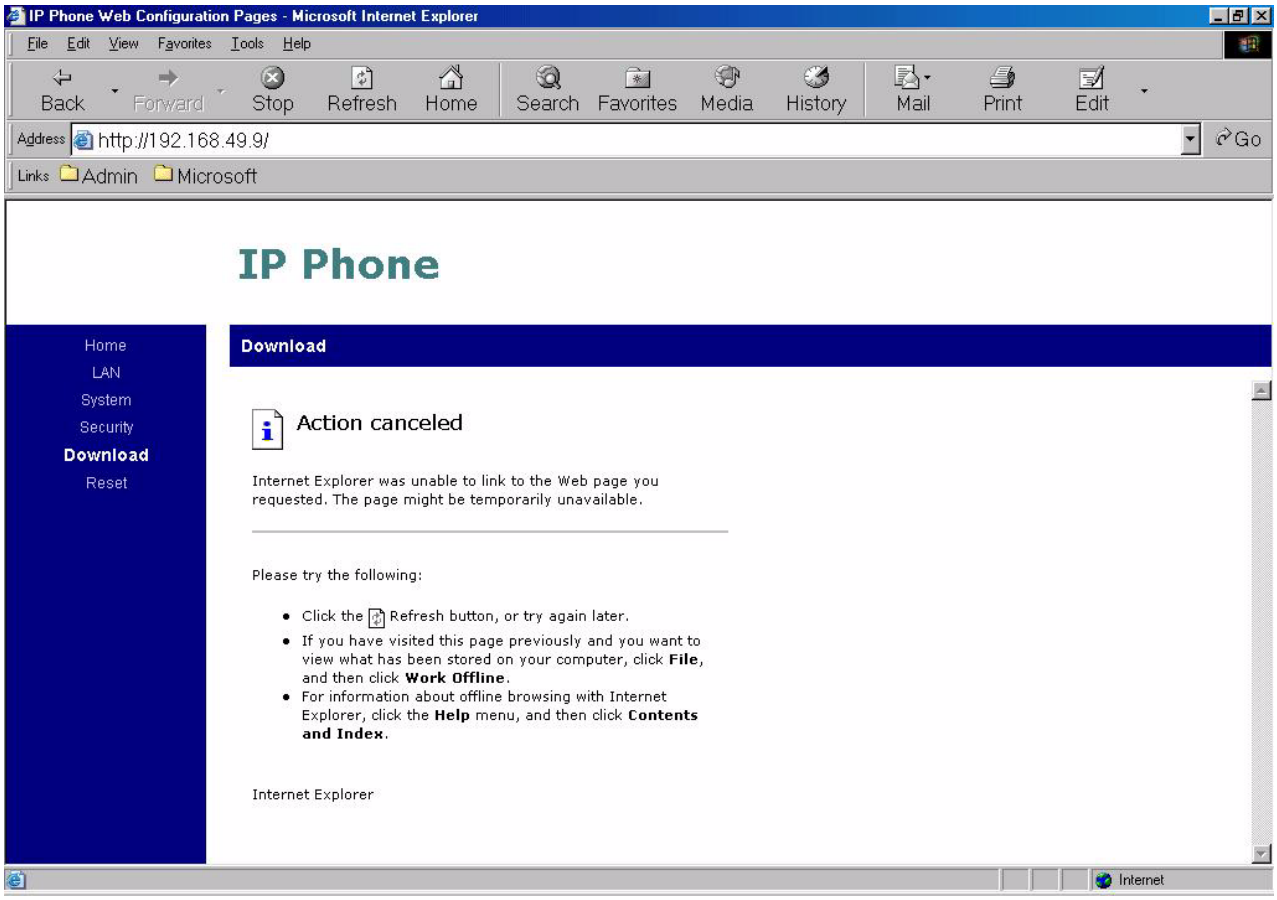
8. Click **OK**. The download time will vary depending on network speed, but generally will take about 3 minutes. The bottom of the window will show the progress of the download.

When the download is complete, the following display will appear:

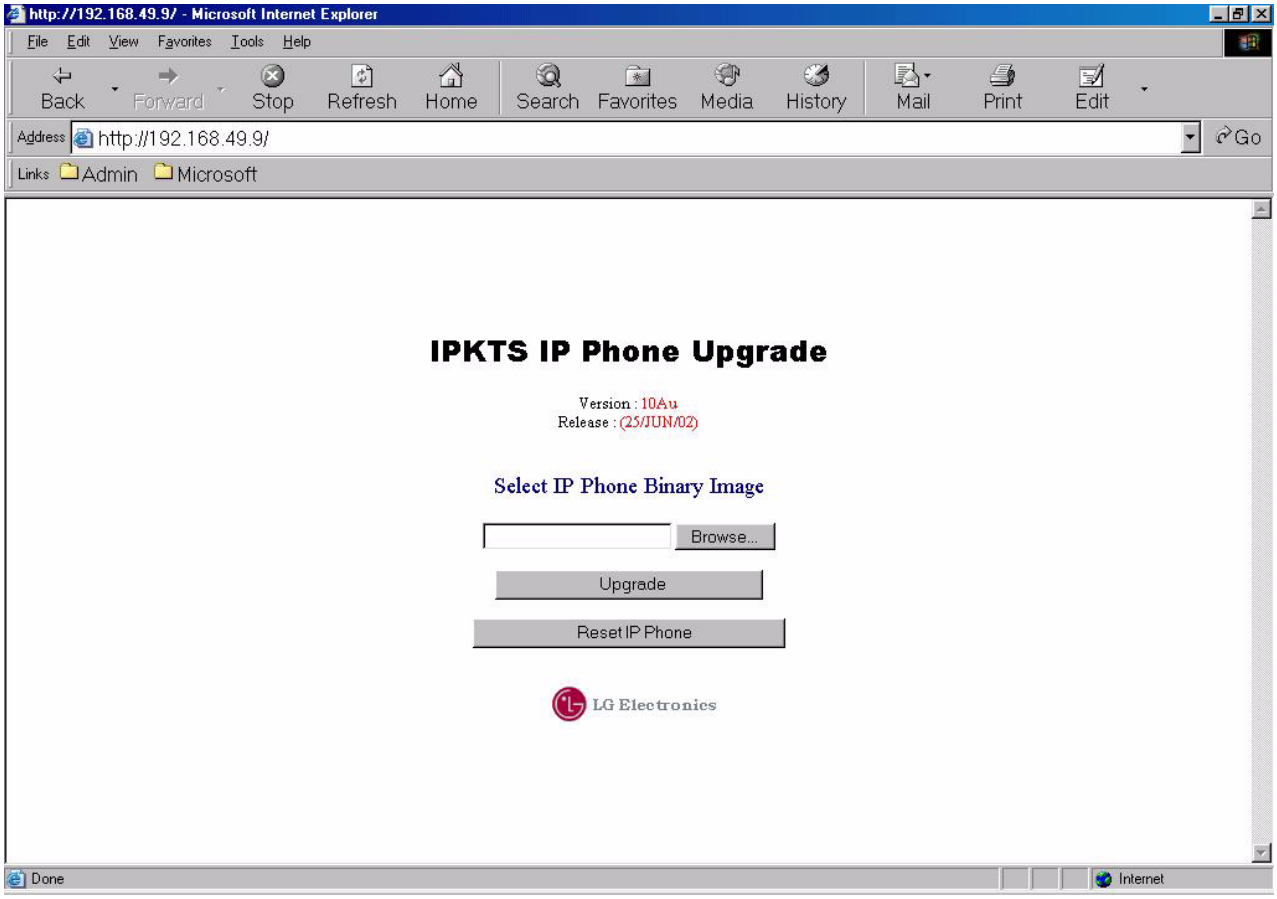


9. Click **Restart Main Application**.

"Action Cancelled" -- Use the following procedure if you receive an "Action Cancelled" window (as shown in the following illustration) when you begin the download process.

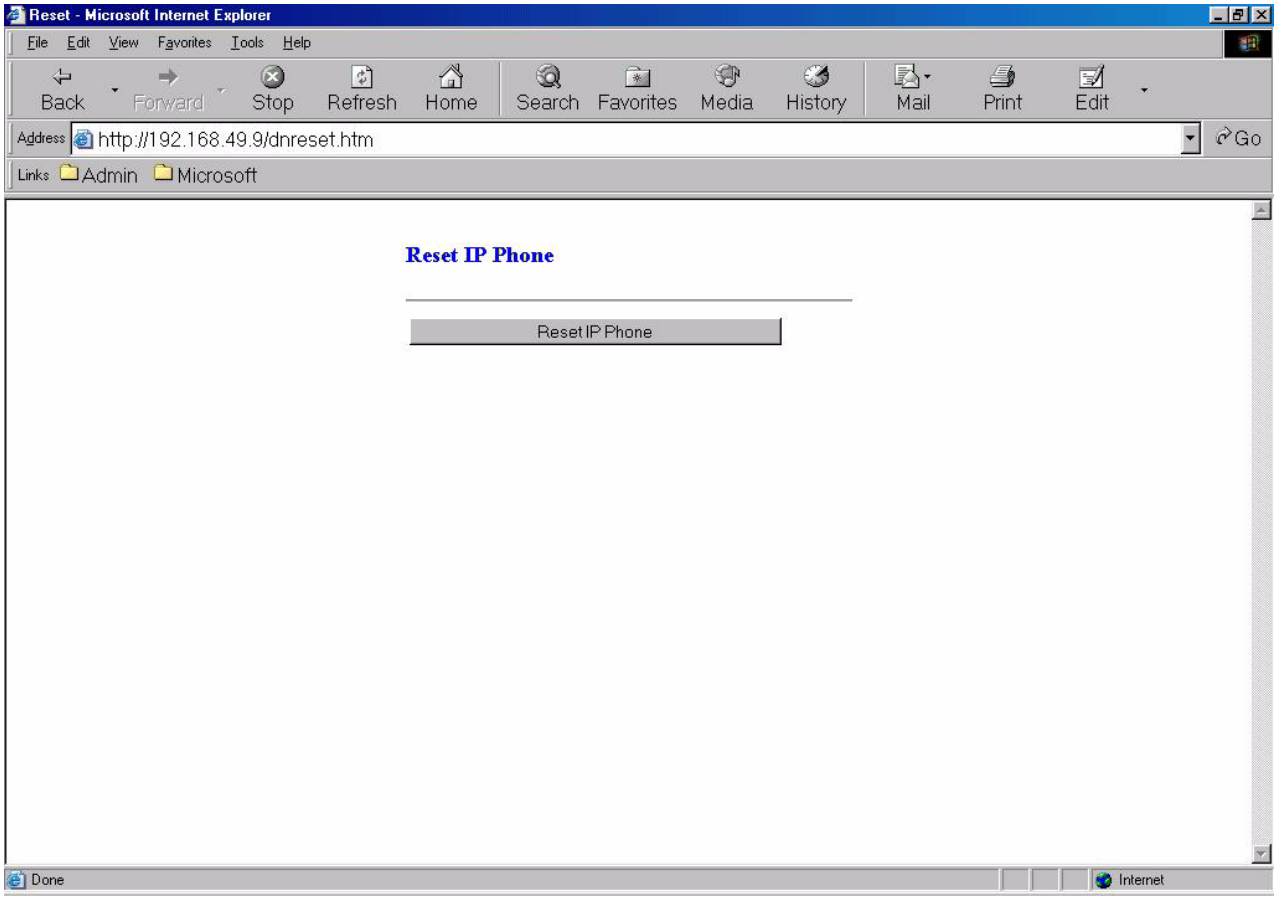

IP Phone Web Configuration Pages - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites Media History Mail Print Edit
Address http://192.168.49.9/
Go
Links Admin Microsoft
IP Phone
Home
LAN
System
Security
Download
Reset
Download
Action canceled
Internet Explorer was unable to link to the Web page you requested. The page might be temporarily unavailable.
Please try the following:
Click the Refresh button, or try again later.
If you have visited this page previously and you want to view what has been stored on your computer, click File, and then click Work Offline.
For information about offline browsing with Internet Explorer, click the Help menu, and then click Contents and Index.
Internet Explorer
Internet

1. Click on the Refresh button in Internet Explorer. The following window will display.



2. Click on the Browse button.
3. Navigate to the file required for the update and click on it to select it.

4. Click on the Upgrade button. After the upgrade is complete, a reset page will appear as shown in the following illustration.



5. Click on the Reset button. The phone will reset, return to normal operation, and the home page will display on the screen.

"Clear the IP Phone Password" -- Use the following procedure to clear the IP Phone password in cases where the password has been forgotten. This will allow access to the IP Phone web access, where you can reset a new password in the security section.

1. Unplug the IP Phone from the network and connect it to a port unrelated to the system to gain the following display.

```
NO RESPONSE FROM MFIM [L]
    SET[*] - RETRY[#]
```

2. Press [*] to get into the Set mode.
3. Press the volume up/down button to select the WEB PASSWORD menu.

   If a web password is in effect, the web password menu will display the following.

```
WEB PASSWORD
[SET] - CLEAR[#]
```

   If a web password is not in effect, the web password menu will display the following.

```
WEB PASSWORD
[NOT SET]
```

4. Press[#] to clear the web password.
5. Plug the IP phone into the network port.
6. Enter the IP address of the IP Phone to enter web administration for the phone without using a password.
7. Use the Security area to assign a new password, if desired.

Nomad RSGM Software Upgrade

To upgrade *Nomad RSGM* software requires two steps.

1. Change the WAN IP address, using an RS-232C cable and terminal emulator program e.g., HyperTerminal.
2. Upgrade the software by using a Web Browser (Internet Explorer is recommended).

Changing WAN IP Address (via RS-232C Interface)

By default, the WAN IP address is set to 10.10.10.8 and the subnet mask is set to 255.255.255.0. However, in most cases the network part of the IP address (10.10.10.X) will not be the same as the network address of the local IP network. To use a Web Browser (running on a PC in the Local IP network) to upgrade software, the WAN IP address must be changed to have the same network address as its Local IP network. Use the following procedure to change the WAN IP address:

1. Connect the RS-232 ports on the *Nomad RSGM* and your PC using a straight-through cable, then launch the terminal emulator program (e.g., HyperTerminal) and apply the following port settings:
   - Baud Rate: 38400
   - Data Bit: 8
   - Parity: None
   - Stop Bit: 1
   - Flow Control: None
2. Click OK. A blank window with a flashing cursor will display.
3. Press Enter, type **?**, then press Enter. The following displays:

```
============================================================
  Command                        Description
============================================================
   wan                      Change to WAN Configuration
   lan                      Change to LAN Configuration
   system                   Change to System Configuration
   status                   Change to System Status
   trace                    Change to Trace Options
   passwd                   Change Password

   reset                    Reset RSGM
   exit (or x)              Exit Monitor Mode
   help (or ?)              Display Help on Menu


main:>
```

4. Type **wan**, then press Enter. The following displays:

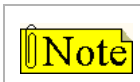
```
main:> wan

 ================================================================
  Command                       Description
 ================================================================
   /                        Change to Root Catalog
   ..                       Change to Parent Catalog
   wanset                   Change to WAN Settings Catalog
   pppoe                    Change to PPPoE Catalog
   wanvlan                  Change to VLAN Catalog

main:/wan>
```

5. Type **wanset**, then press Enter. The following displays:

```
main:/wan> wanset

 ================================================================
  Command                       Description              Mode
 ================================================================
   /                        Change to Root Catalog
   ..                       Change to Parent Catalog
   mode                     Toggle Address Config Mode  : FIXED
   get all                  Read All Parameters
   get [arg]                Read [arg] Parameter
                            {ip|subnet|gateway|dns|host|domain|
                             mac|blimit|mlimit}
   set ip [ipaddr]          Write (Fixed Mode) IP Address
   set subnet [ipaddr]      Write (Fixed Mode) Subnet Mask
   set gateway [ipaddr]     Write (Fixed Mode) Gateway Address
   set dns [ipaddr]         Write (Fixed Mode) DNS Address (..|del)
   set host [string]        Write (Fixed Mode) Host Name (..|del)
   set domain [domain]      Write (Fixed Mode) Doamin Name (..|del)
   set blimit [digt]        Write Broadcast Limit(%) (1-100)
   set mlimit [digt]        Write Multicast Limit(%) (1-100)

main:/wan/wanset>
```

6. Type **get all**, then press Enter. The following displays:

```
main:/wan/wanset> get all

IP Address: 10.10.10.8
Subnet Mask: 255.255.255.0
Gateway Address: 172.16.10.100
DNS Address: N/A
Host Name: N/A
Domain Name: N/A
MAC Address: 00405a12866f
Broadcast Limit: 100 (%)
Multicast Limit: 100 (%)

main:/wan/wanset>
```



The MAC address value is unique for each device.

7. Type **set ip** and the new WAN IP address to identify the *Nomad RSGM* (in our example, 172.16.10.85), then press Enter. The following displays:

```
main:/wan/wanset> get all

IP Address: 10.10.10.8
Subnet Mask: 255.255.255.0
Gateway Address: 172.16.10.100
DNS Address: N/A
Host Name: N/A
Domain Name: N/A
MAC Address: 00405a12866f
Broadcast Limit: 100 (%)
Multicast Limit: 100 (%)

main:/wan/wanset> set ip 172.16.10.85

IP Address Changed Successfully: 172.16.10.85

main:/wan/wanset>
```

8. Change Subnet Mask by typing **set subnet** 255.X.X.X, then press Enter.
9. Change Gateway (router) address by typing **set gateway** X.X.X.X (This is not a mandatory step).

10. Type **?**, then press Enter to access the help menu.

```
main:/wan/wanset> ?

 ================================================================
  Command                      Description              Mode
 ================================================================
   /                        Change to Root Catalog
   ..                       Change to Parent Catalog
   mode                     Toggle Address Config Mode  : FIXED
   get all                  Read All Parameters
   get [arg]                Read [arg] Parameter
                            {ip|subnet|gateway|dns|host|domain|
                             mac|blimit|mlimit}
   set ip [ipaddr]          Write (Fixed Mode) IP Address
   set subnet [ipaddr]      Write (Fixed Mode) Subnet Mask
   set gateway [ipaddr]     Write (Fixed Mode) Gateway Address
   set dns [ipaddr]         Write (Fixed Mode) DNS Address (..|del)
   set host [string]        Write (Fixed Mode) Host Name (..|del)
   set domain [domain]      Write (Fixed Mode) Doamin Name (..|del)
   set blimit [digt]        Write Broadcast Limit(%) (1-100)
   set mlimit [digt]        Write Multicast Limit(%) (1-100)

main:/wan/wanset>
```

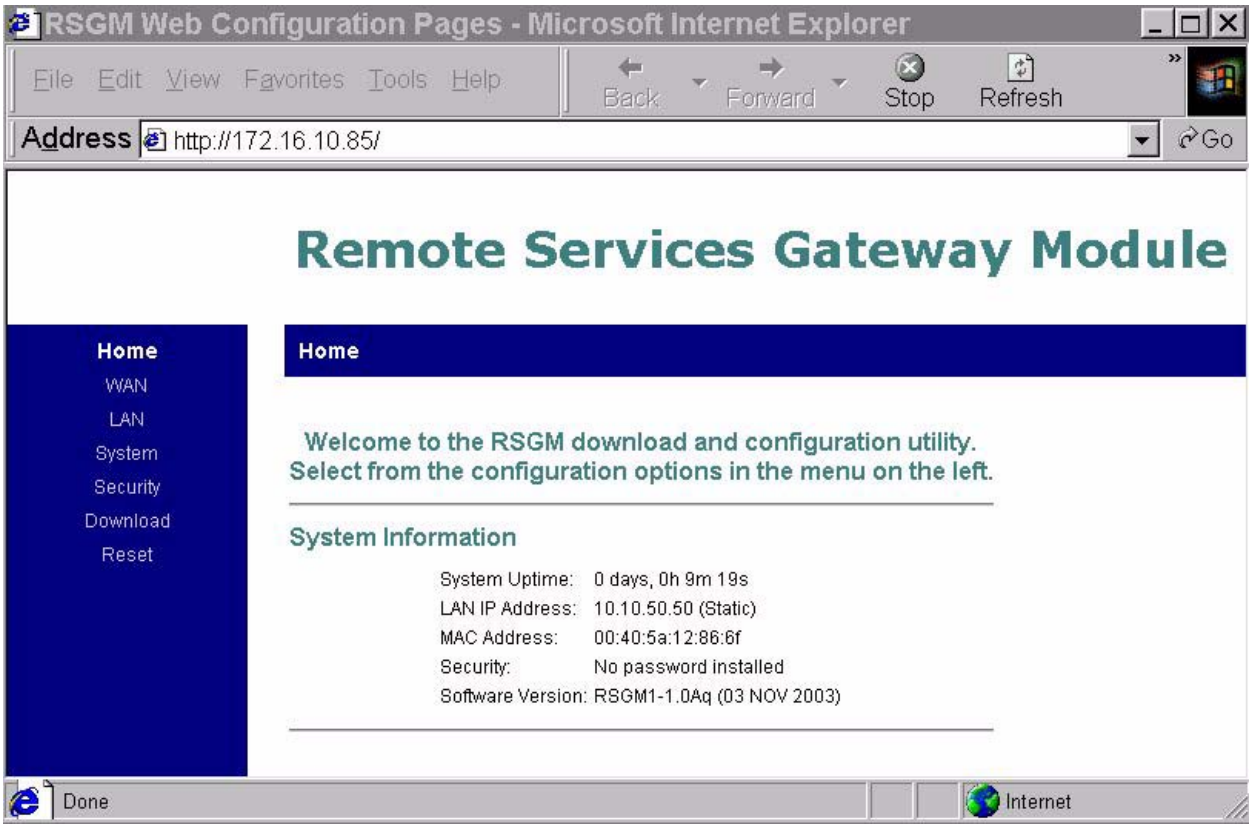
11. Type **/**, then press Enter to return to the main menu (Root Catalog).

```
main:/wan/wanset> /

 ============================================================
  Command                      Description
 ============================================================
   wan                      Change to WAN Configuration
   lan                      Change to LAN Configuration
   system                   Change to System Configuration
   status                   Change to System Status
   trace                    Change to Trace Options
   passwd                   Change Password

   reset                    Reset RSGM
   exit (or x)              Exit Monitor Mode
   help (or ?)              Display Help on Menu


main:>
```

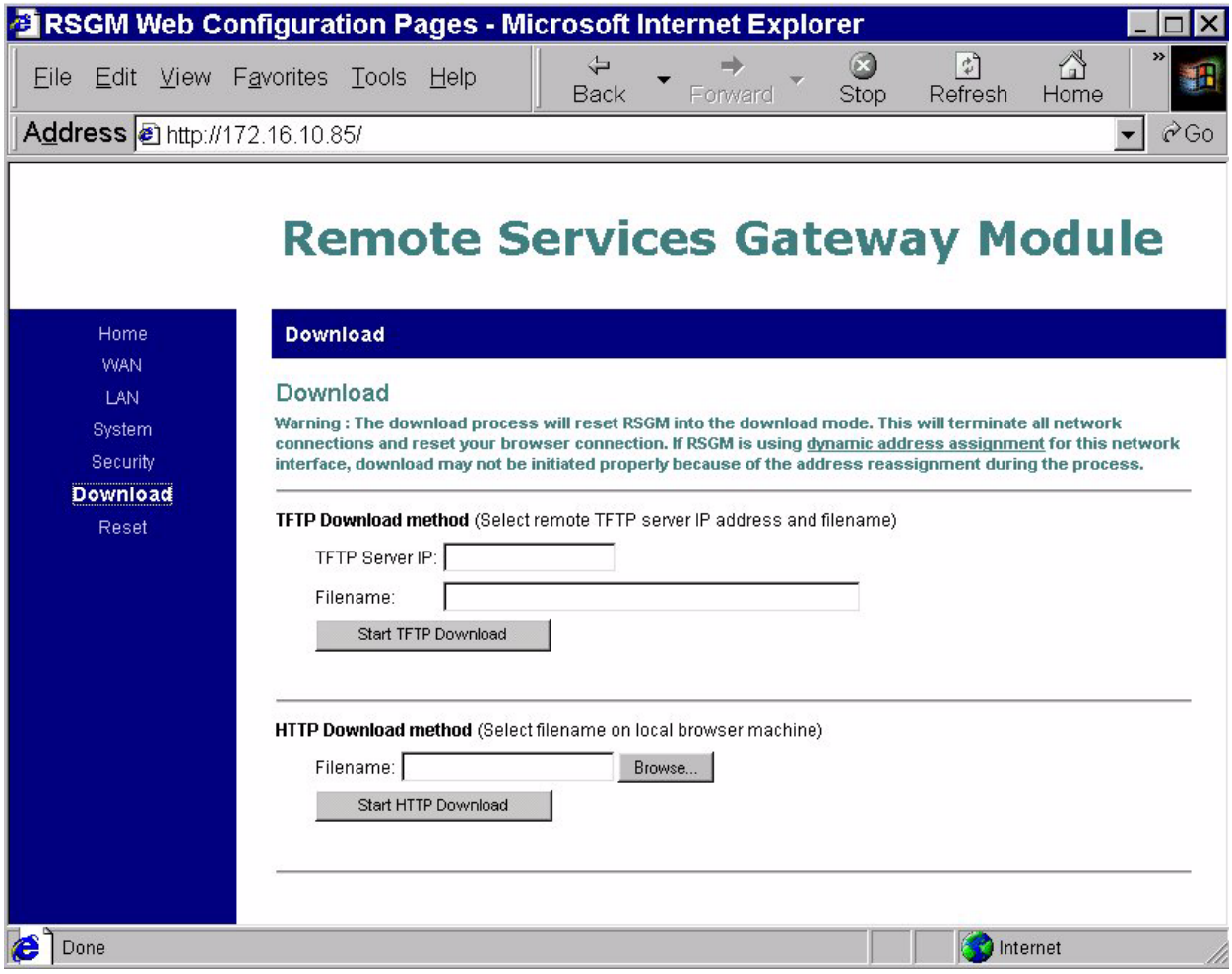
12. Type **reset**, then press Enter.

Upgrade Software Directly (via WAN interface)

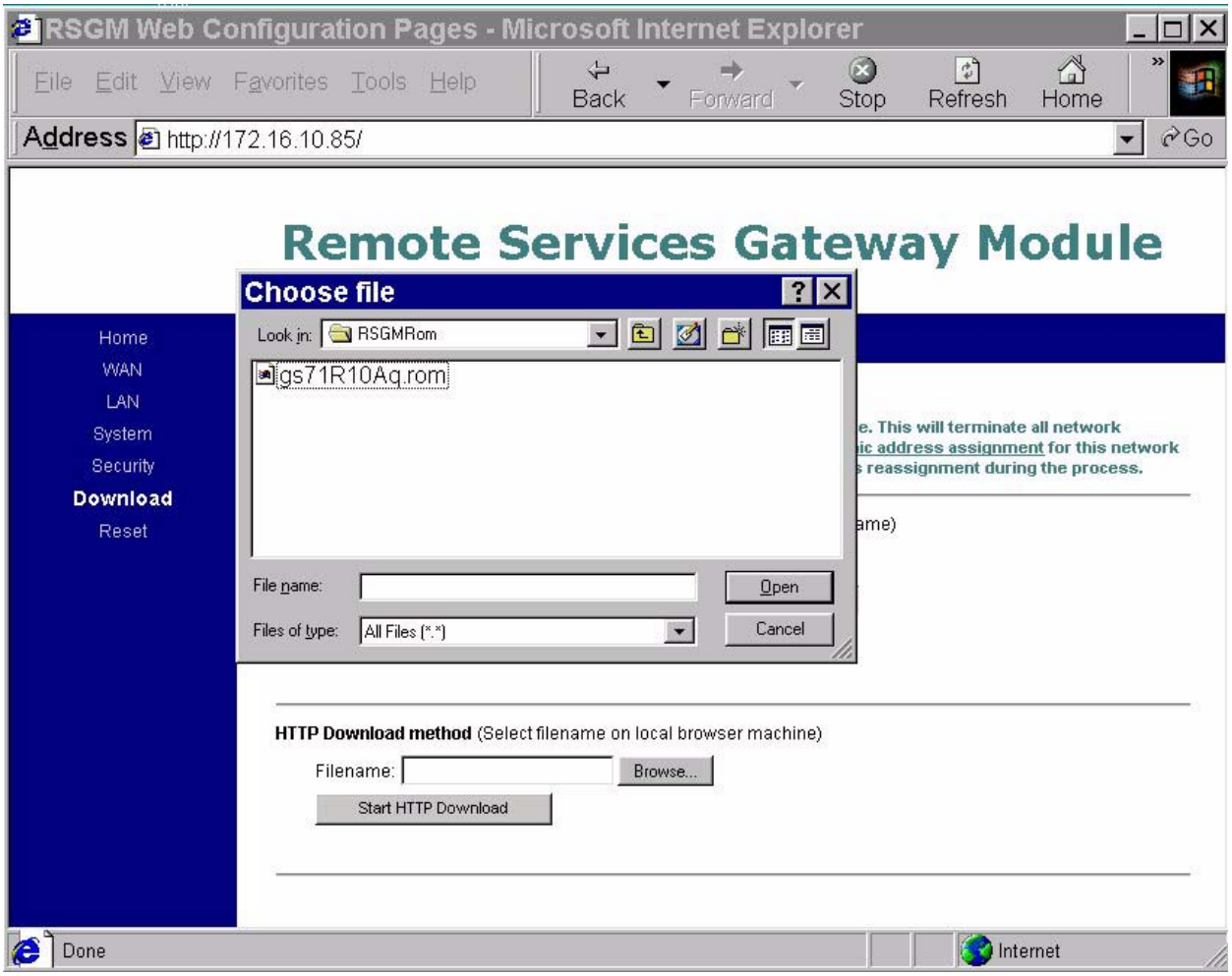
1. Launch your web browser.
2. Type **http://** followed by the WAN IP address (for our example, 172.16.10.85) into the Address box, then press Enter. The following displays:



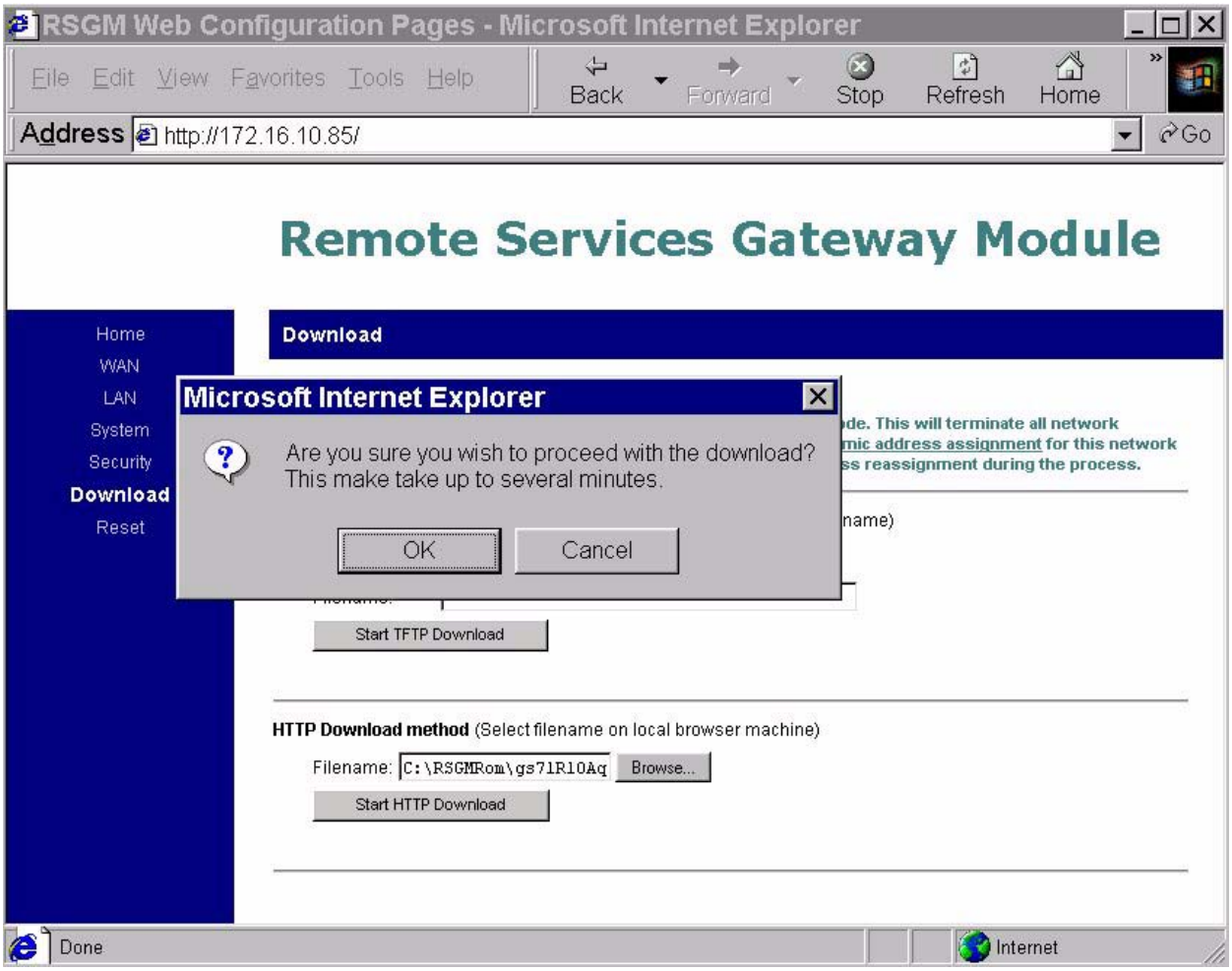
3. Click the **Download** option on the left side of the window in the Blue area. The following displays:


RSGM Web Configuration Pages - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home
Address http://172.16.10.85/
Go
Remote Services Gateway Module
Home
WAN
LAN
System
Security
Download
Reset
Download
Download
Warning : The download process will reset RSGM into the download mode. This will terminate all network connections and reset your browser connection. If RSGM is using dynamic address assignment for this network interface, download may not be initiated properly because of the address reassignment during the process.
TFTP Download method (Select remote TFTP server IP address and filename)
TFTP Server IP:
Filename:
Start TFTP Download
HTTP Download method (Select filename on local browser machine)
Filename:
Browse...
Start HTTP Download
Done
Internet

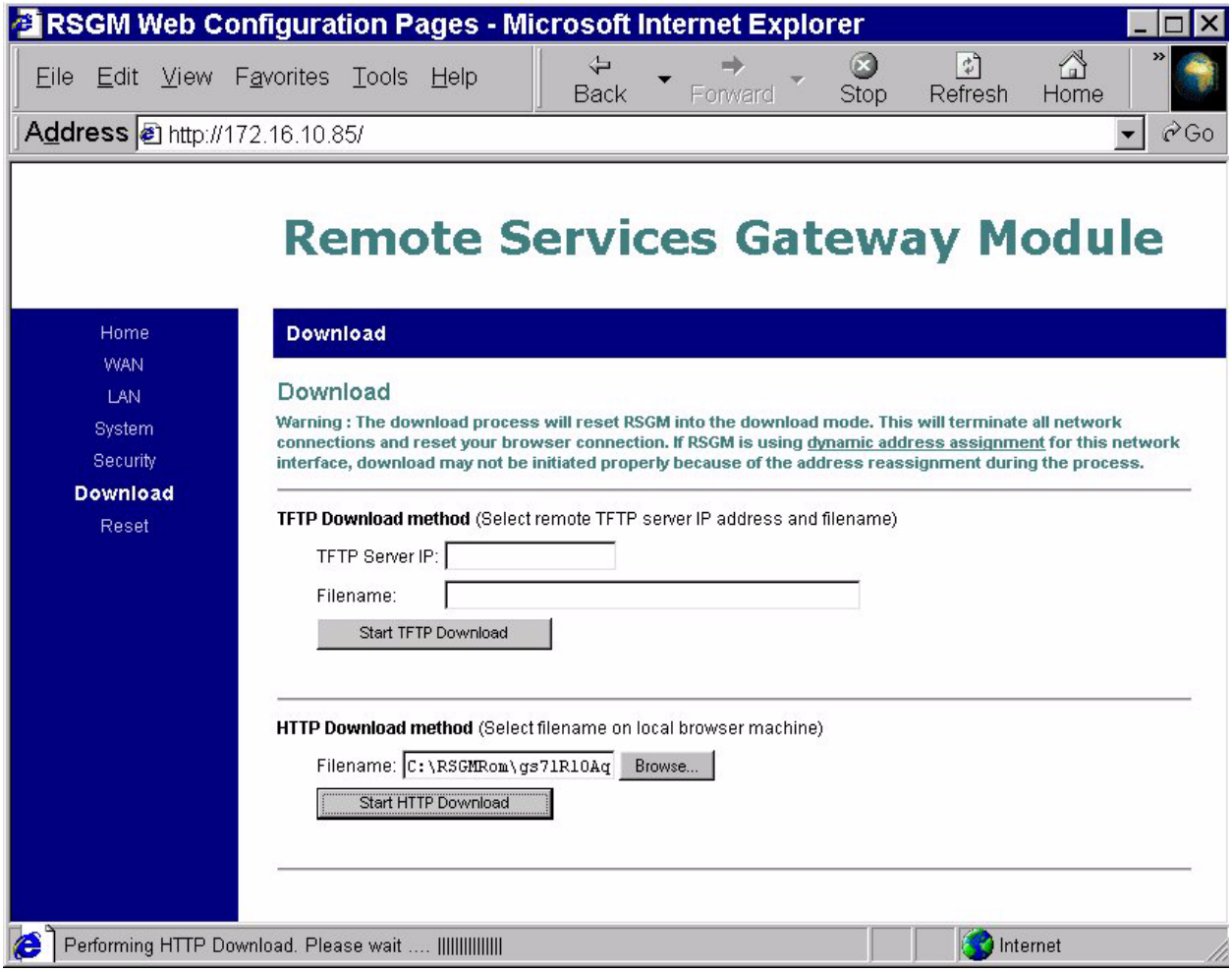
4. Use the HTTP download method and click the **Browse** button in the lower portion of the window. The following "Choose file" window displays:



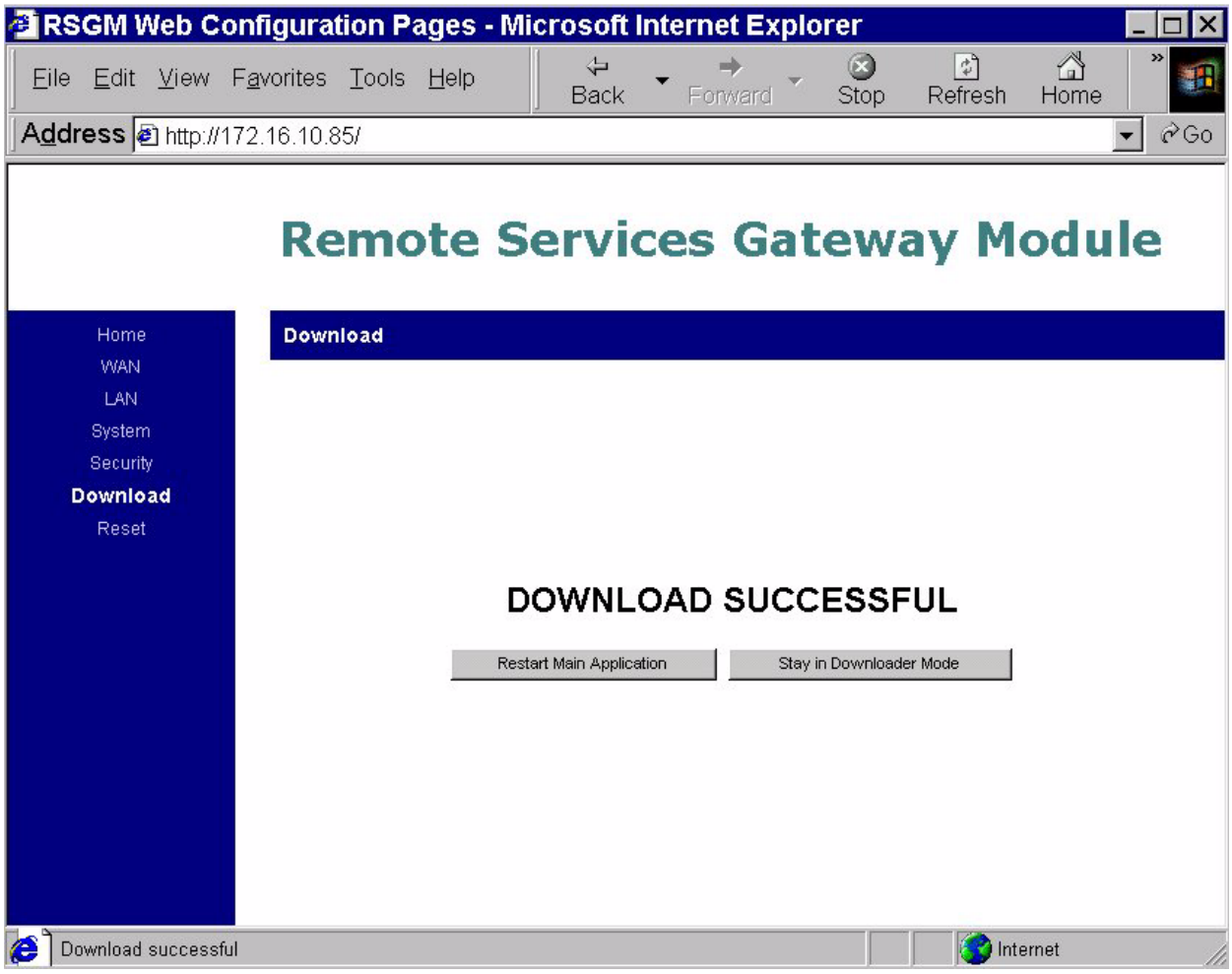
5. Browse to find and select the file containing the new software upgrade (It will have a .rom extension), click the Open button, then click on **Start HTTP download**. The following displays to make sure you wish to proceed with the download.



6. Click **OK**. The download time will vary depending on network speed, but generally will take about 3 minutes. The following display will show the progress of the download.


RSGM Web Configuration Pages - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home
Address http://172.16.10.85/
Go
Remote Services Gateway Module
Home
WAN
LAN
System
Security
Download
Reset
Download
Download
Warning : The download process will reset RSGM into the download mode. This will terminate all network connections and reset your browser connection. If RSGM is using dynamic address assignment for this network interface, download may not be initiated properly because of the address reassignment during the process.
TFTP Download method (Select remote TFTP server IP address and filename)
TFTP Server IP:
Filename:
Start TFTP Download
HTTP Download method (Select filename on local browser machine)
Filename: C:\RSGMRom\gs71R10Aq
Browse...
Start HTTP Download
Performing HTTP Download. Please wait ....
Internet

When the download is complete, the following display will appear:



7. Click **Restart Main Application**.

VoIP Maintenance and Troubleshooting

VoIP Administrative Functions

These functions are accessible through an RS-232 connection via the ADMIN port located on the VoIP card. Configurations and tracing VoIP card events can be viewed from this console connection. No programming can be performed, but firmware upgrades can be done through the admin port.

Locating the VoIP Card through the MPB

1. Attach a straight-through cable to the MPB (RS-232) and use the following HyperTerminal (or other terminal emulation application) settings:

   Baud - 19200 bps

   Data Bits - 8

   Parity - None

   Stop Bit - 1

   Flow Control - None
2. When prompted for a password, type **config**.
3. Type **d s** at the *maint*> prompt to view the location of the VoIP card.

```
ENTER PASSWORD: config
maint>d s
    SLOT       BRD TYPE    SERV STAT   BRD OPTS     FW VER.
 ---------   ----------   -----------  ----------  ---------
     00          DT24         INS          0         00-0
     01          DT24         OOS
     04          VOIP         INS          0         01A-7
```

Figure 4-10: VoIP Card Location Printout

4. At the *maint*> prompt, type **d s4**. (The 4 represents the slot where the VoIP card is located.) The following printout shows which COs are in and out of service.

```
maint>d s4
   SLOT       BRD TYPE     SERV STAT    BRD OPTS    FW VER.
 ---------   ----------   -----------  ----------  ---------
     04          VOIP         INS          0         01A-7

  CO            STATUS          PULSE/DTMF  CO/PBX  STATE
 ---  ----------------------  ----------  ------  -----
   1  INS, Bothway  Enabled       DTMF      CO    IDLE
   2  INS, Bothway  Enabled       DTMF      CO    IDLE
   3  INS, Bothway  Enabled       DTMF      CO    IDLE
   4  INS, Bothway  Enabled       DTMF      CO    IDLE
   5  INS, Bothway  Enabled       DTMF      CO    IDLE
   6  INS, Bothway  Enabled       DTMF      CO    IDLE
   7  INS, Bothway  Enabled       DTMF      CO    IDLE
   8  INS, Bothway  Enabled       DTMF      CO    IDLE
```

Figure 4-11: VoIP In/Out of Service Printout

Entering 8-Port VoIP Card Administration Menus

> **Note** *Refer to "VoIP24 Upgrade Procedure" on page 4-61 for information on VoIP24 Upgrade and Entering VoIP24 Card Administrative Menus.*

1. Attach a straight-through cable to the VoIP card (RS-232) and use the following HyperTerminal (or other terminal emulation application) settings:

   Baud - 9600 bps (changeable to higher rates after initial access)

   Data Bits - 8

   Parity - None

   Stop Bit - 1

   Flow Control - None
2. Press <Enter> and wait for the *password*> prompt.
3. Type the Admin password (**3226vodavi** = default password), the main menu will display:

```
COMMAND      DESCRIPTION
 -------------------------------------

c            Network Configuration Mode
s            System / Call Status Mode
t            Trace Setting Mode
n            Network Troubleshooting
u            LAN Firmware Upload Mode
y            Show Type of Service Value
r            Reset LAN Card

x            Exit
?            Help, Guide

root:\net>
```

Figure 4-12: VoIP Trace - Main Menu

Network Configuration Mode -- From the main menu, type [**c**] to access *Network Configuration Mode*. The following screen will display:

```
COMMAND    DESCRIPTION      STATUS    (Y=On)
 ----------------------------------(N=Off)
r r         Read All           Y
r a         Read IP Address    N
r s         Read Subnet Mask   N
r g         Read Gateway       N
r d         Read Domain Name   N
r n         Read DNS Address   N
r m         Read MAC Address   N

b           Return Back
x           Exit
?           Help, Guide

root:\net>
```

Figure 4-13: VoIP Network Configuration Printout

- Type [**r r**] to access the following *Read All* settings:

```
IP Address              : 102.38.56.1
Gateway Address         : 102.38.56.1
Subnet Mask             : 255.255.255.0
DNS Address             : 165.243.17.15
MAC Address             00:40:5a:01:71:f6
Domain Name             VODAVI.COM
Vocoder                 G.723.1
```

Figure 4-14: VoIP Configuration (Read All)

- Type [**r a**] to access the following *Read IP Address* setting:

```
IP Address              : 102.38.56.1

root:\net>
```

Figure 4-15: VoIP Configuration (Read IP Address)

- Type [**b**] at the net> prompt to return to the main menu.

System/Call Status Mode -- From the main menu, type [**s**] to access *System/Call Status Mode*. The following screen will display:

```
COMMAND          DESCRIPTION
 ------------------------------------

d Addr Length    Memory Dump
s s              Call Status for All Channels
s #              Call Status for Channel #

b                Return Back
x                Exit
?                Help, Guide
```

Figure 4-16: VoIP System/Call Status Printout

- Type [**s s**] to access *Call Status for All Channels*.

```
CHANNEL   CALL STATE    VOICE OUT   VOICE IN
-------------------------------------------

1            Idle          N/A         N/A
2            Idle          N/A         N/A
3            Idle          N/A         N/A
4            Idle          N/A         N/A
5            Idle          N/A         N/A
6            Idle          N/A         N/A
7            Idle          N/A         N/A

root:\stat>
```

Figure 4-17: VoIP (Call Status for All Channels)

- Type [**b**] at the stat> prompt to return to the main menu.

Trace Setting Mode -- From the main menu, type [**t**] to access the *Trace Setting Mode*. The following screen will display:

```
 COMMAND    DESCRIPTION      STATUS        (Y=On)
 ---------------------------------------- (N=Off)
t a         Trace all         Y
t c         MP-PP Command     N
t m         MP-PP Event       N
t h         H.323 Command     N
t e         H.323 Event       N


t s [m|h|a] Set [MP-PP|H.323|All] Cmd/Evt
t r [m|h|a] Reset [MP-PP|H.323|All] Cmd/Evt

b           Return Back
x           Exit
?           Help, Guide

root:\trace>
```

Figure 4-18: VoIP Trace Setting Printout

- Select a Trace Setting option and press <Enter> to change the status.

  (example: [t] <space> [s] <space> [a] is used to set a trace for all events)
- Type [**b**] at the *trace*> prompt to return to the main menu.

Note	*To view trace information, you must exit [x] the administration menus.*

Network Troubleshooting -- From the main menu, type [**n**] to access *Network Troubleshooting*. The following screen will display:

```
COMMAND      DESCRIPTION
 ------------------------------------

t     ip_address    Traceroute
p     ip_address    Ping Function
c     ip_address    CID Function
u     ip_address    User-to-User Function
b     ip_address    Return Back

x     Exit
?     Help, Guide

root:\net>
```

- Select a troubleshooting option and press <Enter>.

To use the Ping Function, type: **p<space>xxx.xxx.xxx.xxx**, then press <Enter>.

Ping is a standard network troubleshooting method to determine if a particular node is operating correctly.

Ping followed by an IP address receives the following response:

```
root:\p xxx.xxx.xxx.xxx

Reply from xxx.xxx.xxx.xxx: bytes 32  time=xxms
Reply from xxx.xxx.xxx.xxx: bytes 32  time=xxms
Reply from xxx.xxx.xxx.xxx: bytes 32  time=xxms
Reply from xxx.xxx.xxx.xxx: bytes 32  time<xxms
Reply from xxx.xxx.xxx.xxx: bytes 32  time=xxms
```

(A “reply from” response indicates that the system can communicate with the other system. A “timed out” response indicates a faulty connection or problem with the other system.)

LAN Firmware Upload Mode - From the main menu, type [**u**] (to select LAN Firmware Upload Mode) and press <Enter>.

1. Type [**c**] (to select *change baud rate*).
2. Type [**4**] to select 57600 bps, then press <Enter>.
3. Reconfigure HyperTerminal to the new baud rate.
4. Type [**y**] to confirm the change to 57600 bps.
5. Type [**?**] to redisplay the LAN Software Upload Mode menu.
6. Type [**u**] (to select *sw upload with Zmodem*) and press <Enter>.
7. Type [**y**] and press <Enter> to begin upload.
8. Click Transfer/Send File.
9. Navigate to and select the correct upload file for the upgrade.
10. Select the **Zmodem** protocol and click **Send**.

Note	*All COs on that card will be out of service.*

11. When “Starting Flash Upgrade!” appears, type [**y**] and press <Enter>.
    - The VoIP card accepts the upload.
    - When the upload is complete, the VoIP card is reset.
    - All VoIP COs are automatically placed back in service.
12. Change the baud rate to 9600 bps using HyperTerminal or other terminal emulation application (disconnect, change the baud rate, re-connect). To change the baud rate, choose the Upload menu again and then select the option to change the baud rate. Follow the instructions on the screen.

Type of Service -- From the main menu, type [**y**] (to select the Show Type of Service Value) and press <Enter>. The following informational screen will display:

```
DESCRIPTION      STATUS                    (Y=On)
-----------------------------              (N=Off)
Delay             N
Throughput        N
Reliable          N

root:\
```

Refer to Flash 46 programming in Appendix D of the Programming & Operations Manual to set a Type of Service (TOS) option that controls bits in the IP datagram header for outgoing packets. There are no set recommendations for using the TOS bits on Vodavi cards because network providers may use TOS bits in a number of ways, or may ignore them completely. Note that making changes to these bits does not by itself have an effect on the VoIP card's performance. Rather, the TOS bits may be used by the network provider's routers to give priority to voice traffic. Setting descriptions for TOS are shown below (note that Flash 46 programming provides options that are combinations of these settings):

- Minimize Delay -- This setting prioritizes the packet in the network device, queuing other packets and delivering the priority packet first. The same happens for inbound packets, producing a lower delay for the packets.
- Maximize Throughput -- This setting provides the packet a greater use of bandwidth through the device, making sure that any contentions for bandwidth are won by the packet with this TOS.
- Maximize Reliability -- This setting verifies that delivery of the packet is guaranteed. Reliable communications usually results in reduced throughput and higher latency in order to guarantee packets reach their destination. Old X.25 networks were very reliable, but also quite slow.
- Normal Service -- No special handling is provided for packets when this setting is used. Most IP packets do not have any of these TOS bits set, meaning that they are treated on a first in first out (FIFO) basis. Normal Service is the default setting in Flash 46 programming.

Reset LAN Card -- From the main menu, type [**r**] and press <Enter>. The VoIP card returns the message: "VoIP card will be reset? Y/N"

- Select **Y** or press <Enter> to reset the card.
- Select **N** to stop the VoIP card from resetting.

Exiting the Administration Menus -- From the main menu, type [**x**] and press <Enter> to exit the Administration menus.

Data Screen Examples

```
ENTER PASSWORD: config
maint>d b
SYSTEM RING MODE - DAY RING

STA    VOICE   TONE   ASSO   HOLD   PARK  CAMP  STATE
-----  ------  -----  -----  -----  ----- ----  -----
K2000  VOICE            C 8                    COL_CONNECTED

COL    VOICE   TONE   ASSO   PREV   STATE
----   -----   ----   ----   ----   -----
C 8    VOICE          K2000         TALK
```

Figure 4-19: Actual CO Line Call via KSU Serial Port

```
1408177 01a 0150 0300 0 18 C 1   VOIPp IDLE - RELEASE ACK
1408177 01a 0003 0300 0 18 C0001        IDLE - Release Ack
1408178 01b 0250 0300 0 18 C 2   VOIPp IDLE - RELEASE ACK
1408178 01b 0103 0300 0 18 C0002        IDLE - Release Ack
1408179 01c 0350 0300 0 18 C 3   VOIPp IDLE - RELEASE ACK
1408180 01c 0203 0300 0 18 C0003        IDLE - Release Ack
1408180 01d 0450 0300 0 18 C 4   VOIPp IDLE - RELEASE ACK
1408181 01d 0303 0300 0 18 C0004        IDLE - Release Ack
1408182 01e 0500 0300 0 18 C 5   VOIPp IDLE - RELEASE ACK
1408182 01e 0403 0300 0 18 C0005        IDLE - Release Ack
1408183 01f 0600 0300 0 18 C 6   VOIPp IDLE - RELEASE ACK
1408183 01f 0503 0300 0 18 C0006        IDLE - Release Ack
1408184 020 0700 0300 0 18 C 7   VOIPp IDLE - RELEASE ACK
1408184 020 0603 0300 0 18 C0007        IDLE - Release Ack
1408185 021 0800 0300 0 18 C 8   VOIPp IDLE - RELEASE ACK
1408185 021 0703 0300 0 18 C0008        IDLE - Release Ack
```

Figure 4-20: Tracing a VoIP Card Status via KSU Serial Port

```
135852 [8][Cmd:MP-PP] TRK_CMD_CALL_REQ
135853 [8][Cmd:H.323] RV_MAKE_CALL (IP:102.38.56.1,Ext:1000)
135853 [8][Evt:H.323] RV_EVT_CALL_STATE_CHANGED (cmCallStateDialtone)
135855 [8][Evt:H.323] RV_EVT_CALL_STATE_CHANGED (cmCallStateRingBack)
135855 [8][Evt:MP-PP] TRK_EVT_ALERT
135855 [8][Evt:H.323] RV_EVT_CALL_NEW_CHANNEL
135855 [8][Evt:H.323] RV_EVT_CALL_NEW_CHANNEL
135855 [8][Evt:H.323] RV_EVT_CHANNEL_PARAMETERS (g7231)
135855 [8][Evt:H.323] RV_EVT_CHANNEL_HANDLE
135855 [8][Evt:H.323] RV_EVT_CHANNEL_SET_ADDRESS(IP:102.38.56.1,Ext:1000)
```

Figure 4-21: Tracing a VoIP Call via VoIP Serial Port

Trace Message Description

Field Descriptions:

hhmmss:ms [x] [message-type:origin] messages

1. ***hhmmss:ms*** = Time of event
   - ***hh*** = hours
   - ***mm*** = minutes
   - ***ss*** = seconds
   - ***ms*** = milliseconds
2. ***[x]*** = Device index (CO) number
3. ***[message-type:origin]*** = Type/origin of message
   - ***message-type*** = Command (CMD, MAKE, DROP, SEND, or ANSWER) or event (EVT) type
   - ***origin*** = master processor (MP)-to-peripheral processor (PP) (HDLC), PP-to-MP (HDLC), or toward/from H.323

Table 4-17: HDLC Messages

Message	Description
TRK_CMD_CALL_FST	Call start request (FastStart) from MP
TRK_CMD_CLR_REQ	Call clear request from MP
TRK_CMD_CONNECT	Call connect request from MP
TRK_EVT_CALL_REQ	Report an incoming call to MP
TRK_EVT_ALERT	Report receiving alert (ring) from destination to MP
TRK_EVT_CALL_PROC	Report receiving call proceed confirmation from destination to MP
TRK_EVT_CONNECT	Report connecting with destination to MP
TRK_EVT_CLR_REQ	Report call was disconnected by destination to MP
TRK_EVT_CLR_REQ_ACK	Acknowledgement of TRK_EVT_CLR_REQ

Table 4-18: H.323 Messages

H.323 Message	Descriptions
RV_MAKE_CALL	Make a new call with specified IP:Ext
RV_EVT_CALL_STATE_CHANGED	Reports changes in call state (dialtone, proceeding, alerting, etc.)
RV_EVT_CALL_NEW_CHANNEL	Reports that there has been a request to open an incoming channel
RV_EVT_CHANNEL_PARAMETERS	Specifies parameters for a new channel (G.723.1, G.711, G.729, etc.)
RV_EVT_CHANNEL_SET_ADDRESS	Specifies the address to which the outgoing media stream should be sent
RV_EVT_CHANNEL_SET_RTCP_ADDRESS	Specifies the address to which RTCP packets should be sent
RV_EVT_CHANNEL_STATE_CHANGED	Channel state has been changed (connected, idle, disconnected, etc.)
RV_EVT_CALL_NEW_RATE	Reports changes in call rate
RV_EVT_CALL_CAPABILITIES	Reports changes in the remote party's capabilities
RV_EVT_CALL_FACILITY	Reports a facility message has arrived
RV_EVT_CALL_CAPABILITIES_RESPONSE	Reports the response of the remote system to the capabilities that have been sent
RV_EVT_CALL_MASTER_SLAVE_STATUS	Reports the response of the remote system to the master/slave inquiry
RV_DROP_CALL	Disconnect a call
RV_EVT_NEW_CALL	Reports an incoming call
RV_EVT_CALL_FASTSTART_SETUP	Reports the attempt of the remote station to use the fast start procedure
RV_EVT_CALL_INFO	Reports incoming call parameters
RV_ANSWER_CALL	Answers current incoming call
RV_SEND_CALL_STATUS_ENQUIRY	Sending Status Enquiry message to remote

Frequently Asked Questions

Can a wireless connection be used between sites?

Wireless connections (microwave or 802.11b) typically do not meet the recommended 100 mbps connection speeds, but have been shown to be quite capable for VoIP connectivity. The only considerations should be the affects the link has on latency, jitter, and QoS. These are the same considerations for any IP connection.

Can Network Address Translation be used with the VoIP card?

Network Address Translation (NAT) is a function of a router. The original implementations of NAT did not take into account the streaming functions of H.323 or other similar protocols. Thus, NAT prevents VoIP calls from establishing a voice connection. It is recommended that you avoid the use of NAT completely.

What factors affect voice quality?

The major factors for voice quality are latency, jitter, and wiring.

Latency is increased if the total available bandwidth is lower. In the case of a 512k connection that has 400k of data running through it, the latency is greatly increased than when the 512k connection has no data running through it.

Jitter is the fluctuation in latency. This is generally seen when a large amount of traffic is creating large fluctuations in utilized bandwidth (utilization). A network that exhibits latency of 20ms followed by 120ms has a very difficult jitter to compensate for in the software voice processing. A *jitter buffer* is used to minimize this affect.

Category 5 or higher cable must be used with RJ-45 connectors.

How is the VoIP card programmed?

Standard Vodavi flash programming is used to program the VoIP card. Programming is stored on the MPB (Master Processor Board) and read by the VoIP card upon reset of the system or the VoIP card.

VoIP Troubleshooting Guide

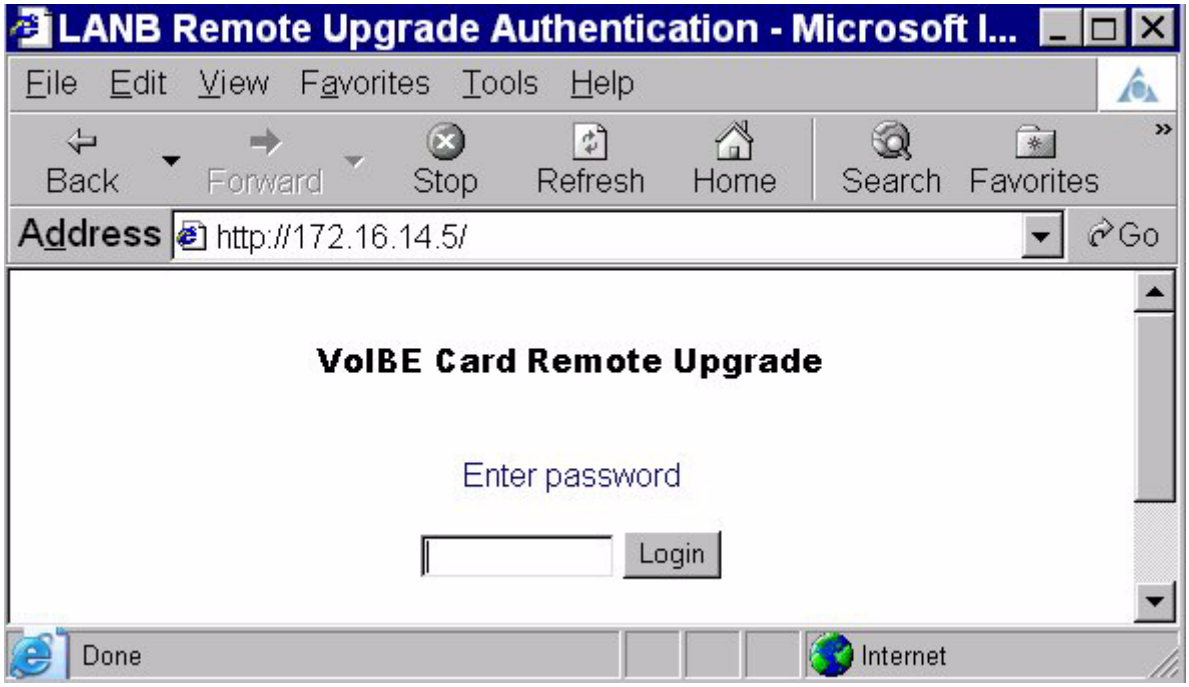
Table 4-19: Troubleshooting

Symptom	Suggestion
The channel lights flash continuously in sequence …	Reseat the VoIP card, then reset the card. Also check slot assignment in Flash 24.
The VoIP card is not responding or has abnormal light appearances …	Reset the VoIP card. Reset the entire system if two VoIP card resets do not resolve the issue. If problem remains after resets, check all programming for the VoIP card (especially Flash 24 and Flash 46).
Unable to Ping another known IP address on the local network …	Verify that the IP address and subnet mask is correct. Check cabling for correct network connections. Contact the network administrator if addresses are correct.
Unable to establish call with remote system (immediate error tone) …	Verify that the correct line group, extension range, and IP address are entered in Flash 16. Also verify that the Service Switch is set to normal on both systems.
Unable to establish call with remote system (delayed error tone) …	Have the caller contact their network administrator to verify that the router (gateway) IP address is correct (Flash 46, Button #3). Network Address Translation (NAT) may be in use if going to the internet or using a WAN. Contact the network administrator to discontinue using NAT for the VoIP card.

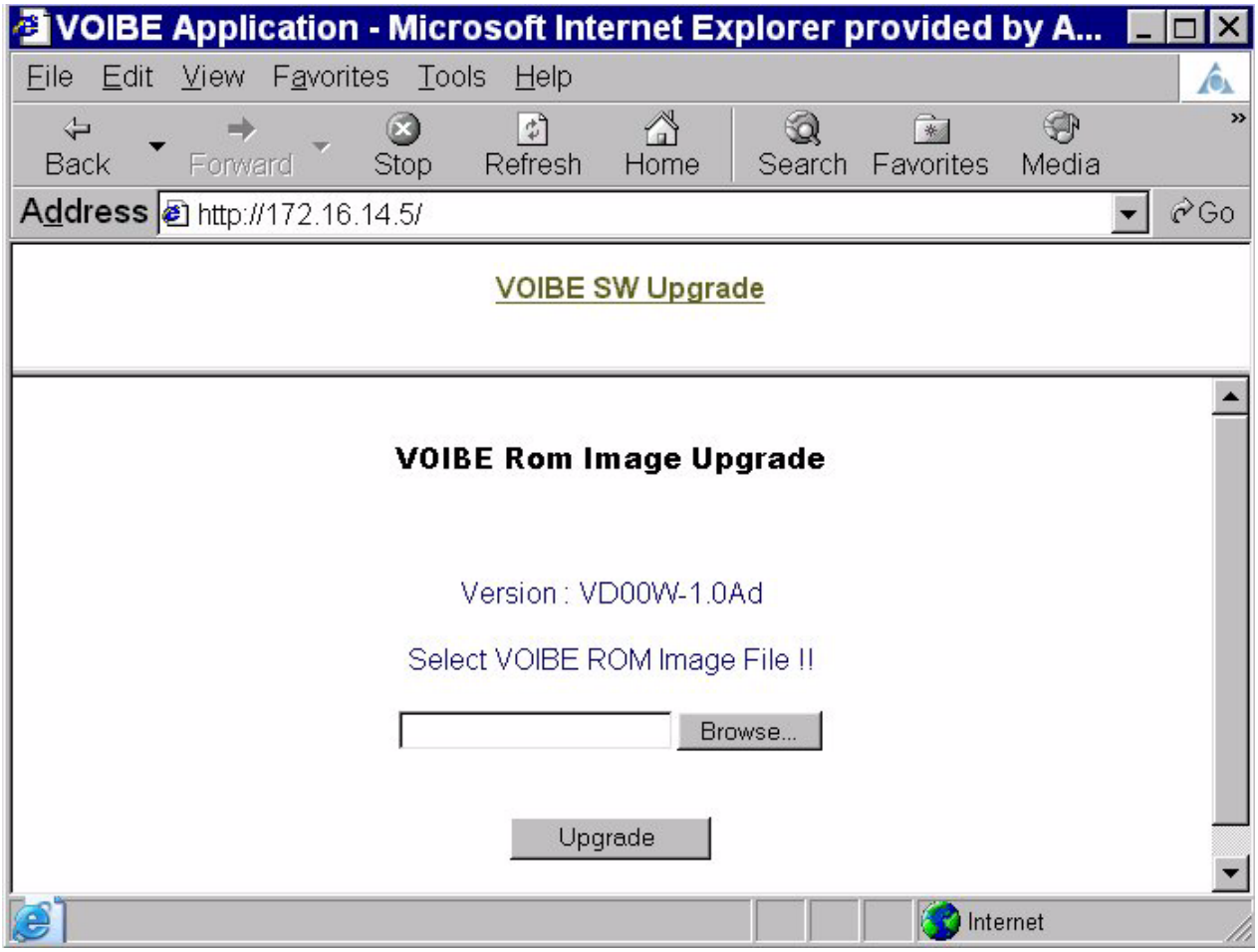
VoIP24 Upgrade Procedure

Use the following procedure to upgrade VoIP24 software.

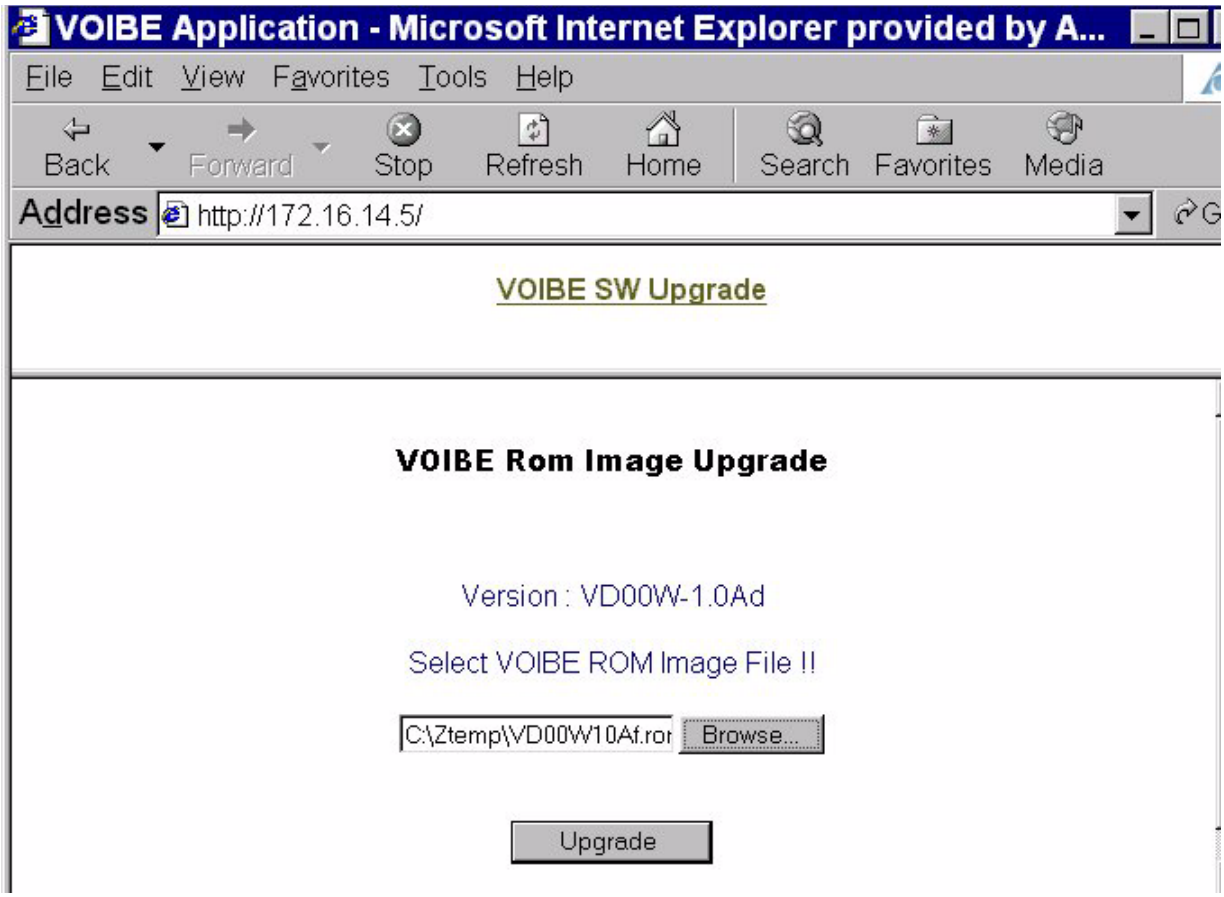
1. Enter the IP address of the VoIP24 card into the Address box of Internet Explorer and press [Enter]. The following displays:



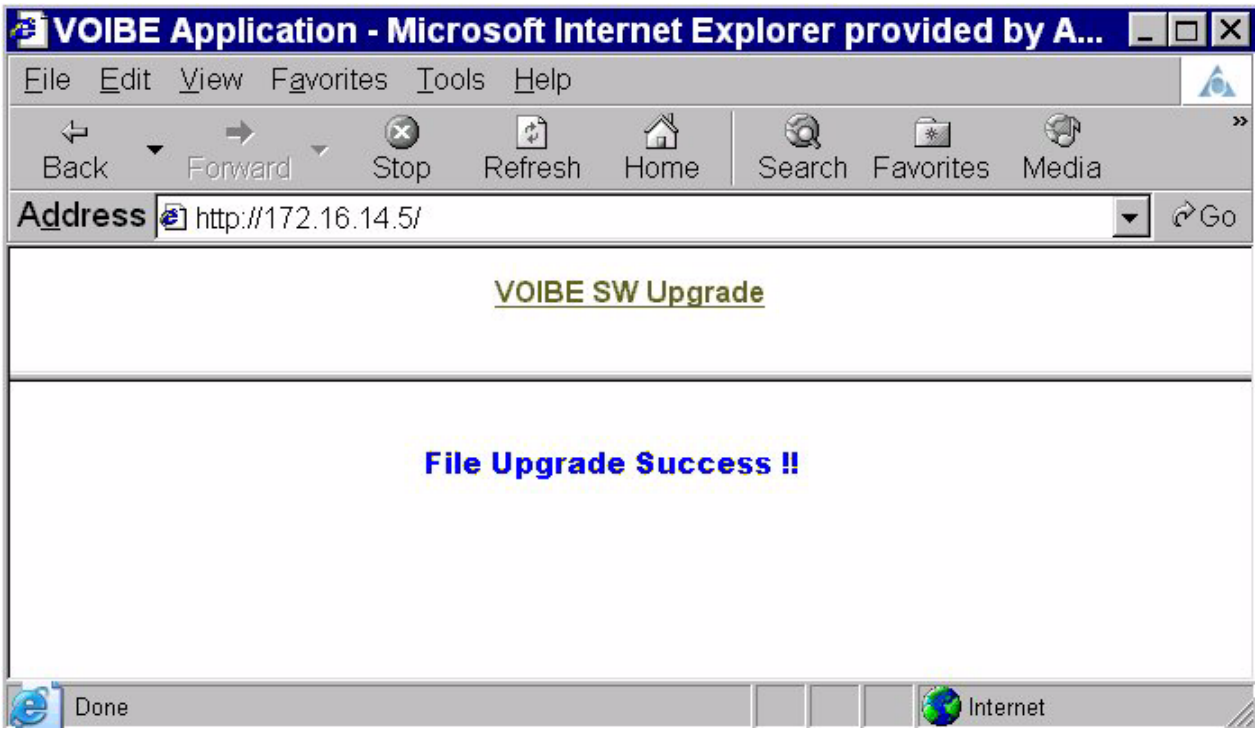
2. Type the Admin password (**3226vodavi** = default password)., then click on Login.



3. Click on the Browse button, navigate to the new upgrade file and select it, then click on the Upgrade button.


VOIBE Application - Microsoft Internet Explorer provided by A...
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites Media
Address http://172.16.14.5/
VOIBE SW Upgrade
VOIBE Rom Image Upgrade
Version : VD00W-1.0Ad
Select VOIBE ROM Image File !!
C:\Ztemp\VD00W10Af.ror
Browse...
Upgrade

The following window appears to inform you that the upgrade has been successfully completed.



4. Reset the VOIP24 card.

Use the procedure in *"Entering VoIP24 Card Administration Menus" on page 4-65* to confirm what the latest upgrade that has been applied.

Entering VoIP24 Card Administration Menus

1. Attach a straight-through cable to the VoIP24 card (RS-232) and use the following HyperTerminal (or other terminal emulation application) settings:

   Baud - 38400 bps

   Data Bits - 8

   Parity - None

   Stop Bit - 1

   Flow Control - None
2. Press <Enter> and wait for the *password*> prompt.
3. Type the Admin password (**3226vodavi** = default password), the main menu will display:

```
COMMAND                          DESCRIPTION
 ------------------------------------

nc                               Network Configuration
bc                               Board Configuration
dir c                            Display files
del c <filename>                 Delete a file
tos                              Display files
iph                              Display IPPhone Control Info
t |s|r| |mppp|H323|RSGM|DSP|     Set/Reset trace data
t v                              View trace ON/OFF mode

h                                Help
x                                Log off
maint>
```

Figure 4-22: VoIP24 Trace - Main Menu

4. Type **nc** after the maint> prompt to view the Network Configuration.

```
======== Network Configuration =========
 Local IP address   : 67.99.1.29
 Subnet mask        : 255.255.255.224
 Gateway IP address : 67.99.1.1
 MAC address        : 00:40:5A:13:89:5B
maint>
```

5. Type **bc** after the maint> prompt to view the Board Configuration. This selection shows the latest software upgrade that has been applied.

```
============= Board Configuration ==============
 - Current Ver. : VD00W-1.0A, Ethernet link
 - Revision History
   -. 1.0Aa, VOIBE for VTI, initial
   -. 1.0Ac, VOIBE for VTI, VOIB_INFO
   -. 1.0Ad, VOIBE for VTI, LIP-7000 LCD
   -. 1.0Ae, VOIBE for VTI, LIP-7000 BACK LIGHT
   -. 1.0Af, VOIBE for VTI, LCD DISPLAY
 - Total Channel No. : 24
 - Codec Type : G.723.1
maint>
```

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